Open Test Lane Forms Book

MAN/PAY 1-5 and Related Scenarios

AIRCRAFT SYSTEM

MAKE: _____

MODEL: _____

CONFIG: _____

REMOTE PILOT

CODE: _____ (INITIALS or ANONYMOUS)

NAME: _____

ATTEST: _____

VISUAL OBSERVER

NAME: _____

ATTEST: _____

PROCTOR

NAME: _____

ATTEST: _____

DATE: _____

FACILITY: _____

LOCATION: _____

MAN 1-5 SCORES

TRIAL TIMES: 5 | 10 | ___ minutes (circle one)

1) POSITION: _____ of **100** Points

2) TRAVERSE: _____ of **100** Points

3) ORBIT: _____ of **100** Points

4) INSPECT: _____ of **100** Points

5) RECON: _____ of **100** Points

of 500 Points

PAY 1-5 SCORES

TRIAL TIMES: 10 | 20 | ___ minutes (circle one)

1) POSITION: _____ of 100 Points

2) TRAVERSE: _____ of 100 Points

3) ORBIT: _____ of 100 Points

4) INSPECT: _____ of 100 Points

5) RECON: _____ of 100 Points

of 500 Points

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The NIST Team includes:
Adam Jacoff, Raymond Sheh, Kamel Saidi,
Kenny Kimble, and Ann Virts.

Dozens more people have contributed to the development and validation of these test methods. They include FEMA urban search and rescue task force teams, firefighters, law enforcement, collaborating test facilities, other civilian and military organizations, and commercial manufacturers. There are far too many to mention, but some of the ongoing (non-commercial) collaborators are listed below, roughly in order of their involvement.

Disclaimer

Commercial equipment shown in this document are for illustrative purposes only. This does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the products identified are necessarily the best available for the purpose.

Measurement Units

The International System of Units (a.k.a. SI Units) and U.S. Customary Units (a.k.a. Imperial Units) are used throughout this document. Approximate equivalents in each system of units enable use of readily available materials in different countries. This avoids excessive purchasing and fabrication costs. The differences between the stated unit dimensions are insignificant for comparison of test method results, so each set of units are considered standard for the purposes of these test methods.

Download Associated Files

This file and others are available for download from a website. See the links below that are active in electronic pdf versions. Otherwise go to the website to download the electronic version from the Aerial Test Methods page.

WEBSITE: DOWNLOAD FORMS AND STICKER FILES HERE

WEBSITE: WATCH THE VIDEO VERSION WITH FLY THROUGH ANIMATIONS HERE

Collaborators

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Open Test Lane

Maneuvering (MAN 1-5) and Payload Functionality (PAY 1-5)

Safety | Capabilities | Proficiency

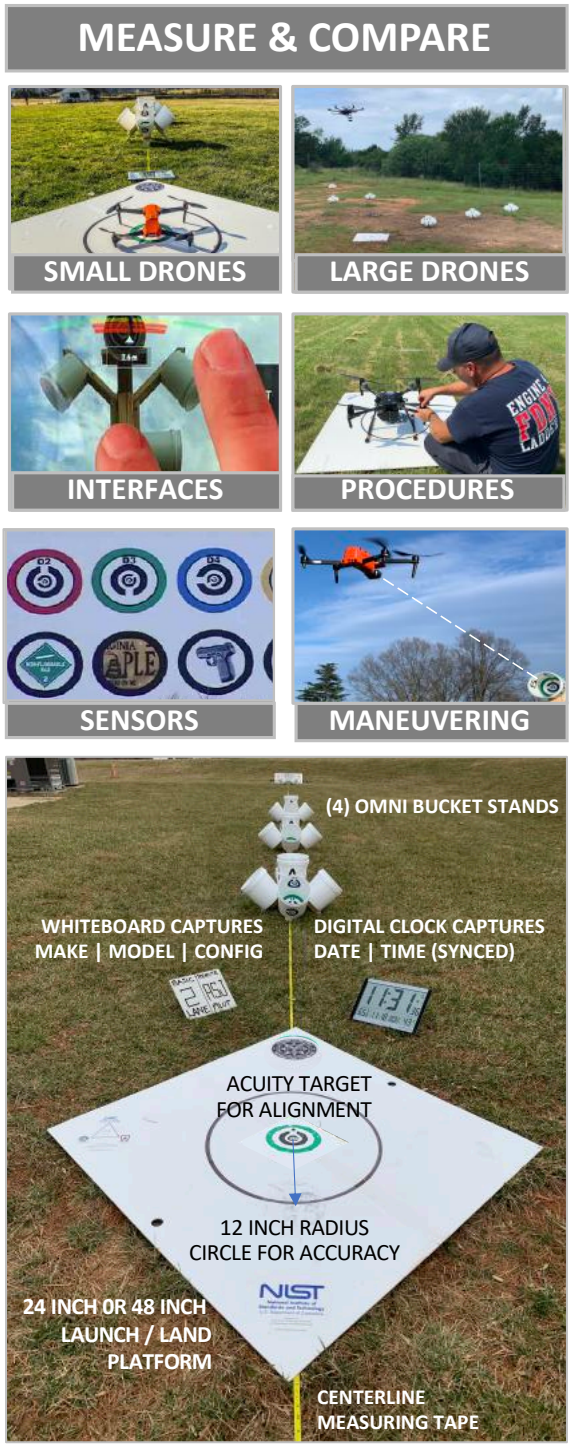
Introduction

Remotely operated aerial systems enable emergency responders to perform extremely hazardous tasks from safer stand-off distances. The U.S. National Institute of Standards and Technology is leading an international effort to develop standard test methods to help manufacturers, procurement professionals, and users objectively evaluate system capabilities and remote pilot proficiency to align with mission requirements. This improves the safety and effectiveness of emergency responders as they save lives and protect property in our communities

The first step toward credentialing remote pilots is to get everybody onto the same measuring stick. That's where standard test methods can play a key role. These test methods for Basic Maneuvering (MAN 1-5) and Payload Functionality (PAY 1-5) are being replicated across the country and internationally to focus training with quantitative measures of remote pilot proficiency. They are low cost and easy to replicate so everyone can measure their own progress over time and compare their proficiency to regional or national averages on similar systems. Concurrent test lanes can be set up to enable multiple systems and pilots to train or evaluate simultaneously.

They are being standardized through the *ASTM International Standards Committee on Homeland Security Applications; Response Robots (ASTM E54.09)*. They are also referenced as Job Performance Requirements in the *National Fire Protection Association Standard for Small Unmanned Aircraft Systems Used For Public Safety Operations (NFPA 2400)* and the *ASTM Standard Guide for Training for Remote Pilot in Command of Unmanned Aircraft Systems Endorsement (ASTM F38.03).*

These suites of standard test methods provide common measures of capabilities with quantitative results. They can be conducted individually, in sequences, or embedded into operational training scenarios as repeatable tasks with scores to augment qualitative assessments. Organizations using these tests set their own thresholds of acceptable system and pilot performance to align with their airspace, environment, and mission complexities. Those decisions are easier to make and trust when they are based on quantitative performance data captured within standard test methods.



Scope of Systems

These test methods are primarily intended for vertical takeoff and landing systems with an onboard camera and remote pilot display. Some test methods are also applicable to fixed wing systems when the lane dimensions are extended to accommodate the orbit radius of forward flying aircraft.

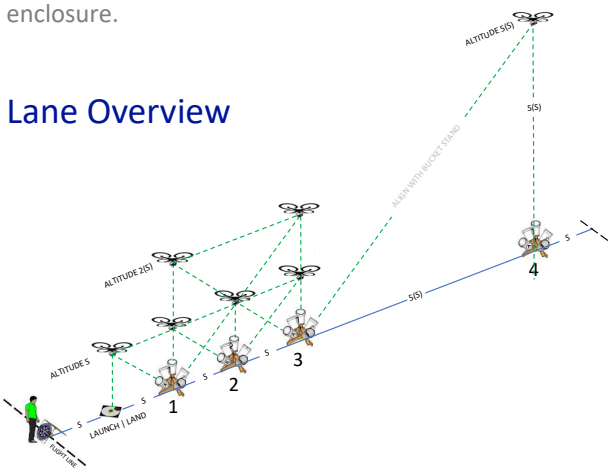
Summary of Tests

These test methods are performed by a remote pilot in direct line of sight of the test lane, or with the pilot's back turned and a visual observer ensuring safe operations. The latter forces reliance on the interface for all situational awareness as required for flying beyond line of sight or indoors.

The aircraft performs the series of maneuvering paths around the apparatuses. Each path includes alignments with one or more cylindrical white buckets to identify recessed targets inside. Successful alignment is achieved when no steering corrections are necessary to verify an unobstructed view of an inscribed ring at the bottom of each bucket. Additional targets inside evaluate camera pointing and zooming capabilities including visual, color, and thermal acuity, hazardous material labels, or other objects of interest.

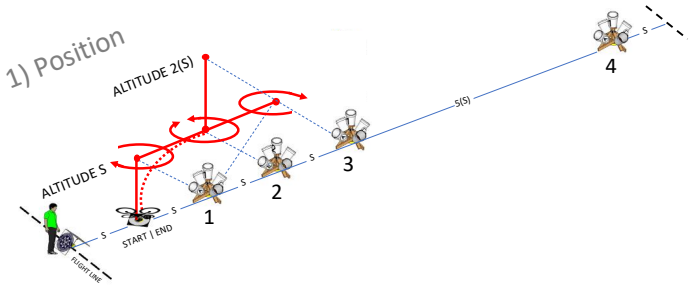
Environmental conditions can be controlled indoors for lighting and wind. Outdoor conditions should be chosen purposefully so not to affect the results. Faults include extreme deviations from the intended flight paths or contact with the apparatus, ground, or safety enclosure.

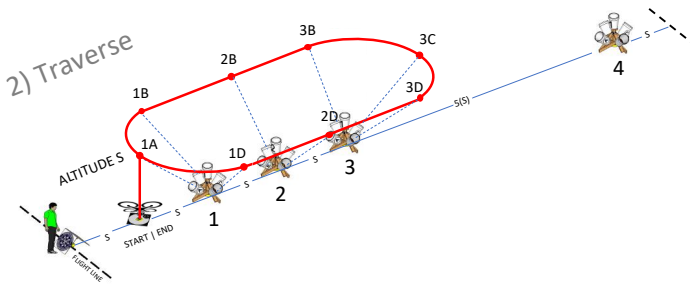
Lane Overview

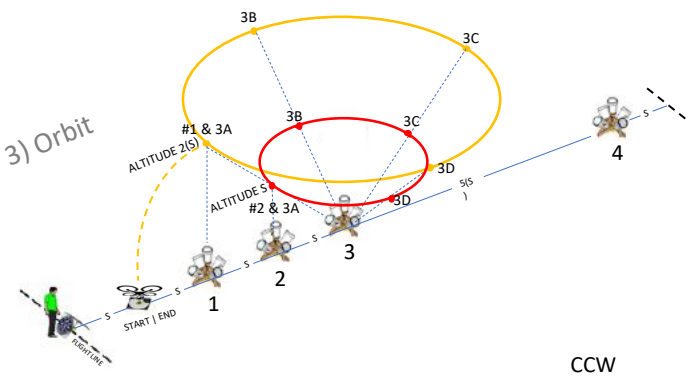


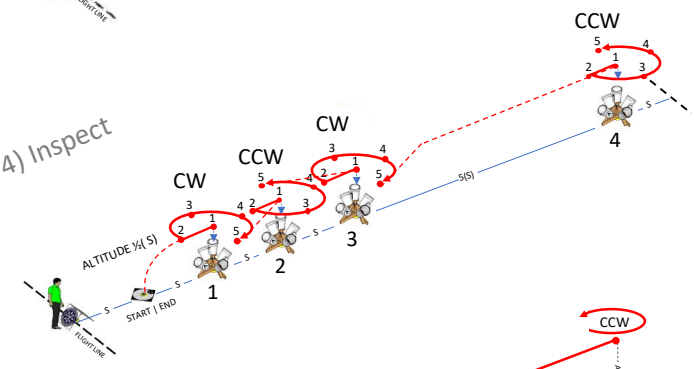
- Pilot flight line and lane marker maintain safety
- Centerline is a long measuring tape
- Spacing (S) equals 10ft, 20ft, 30ft or other
- Overall length 10(S) equals 100ft, 200ft, 300ft or other

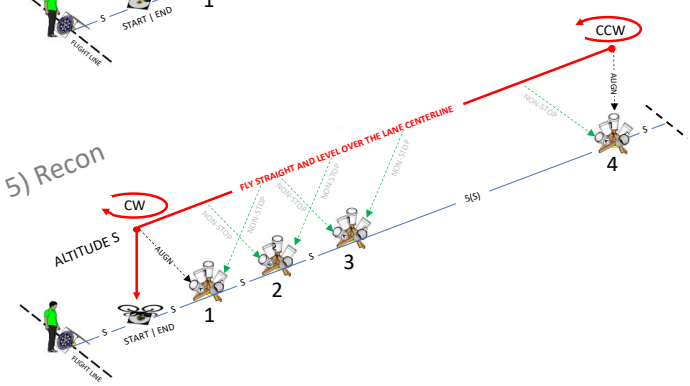
Flight Paths











Conduct Tests Two Ways

Open Test Lane

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

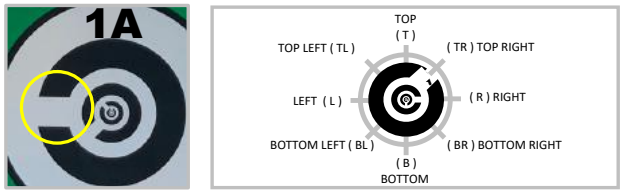
20 ALIGNMENTS TOTAL UP TO 100 POINTS

Payload Functionality (PAY)

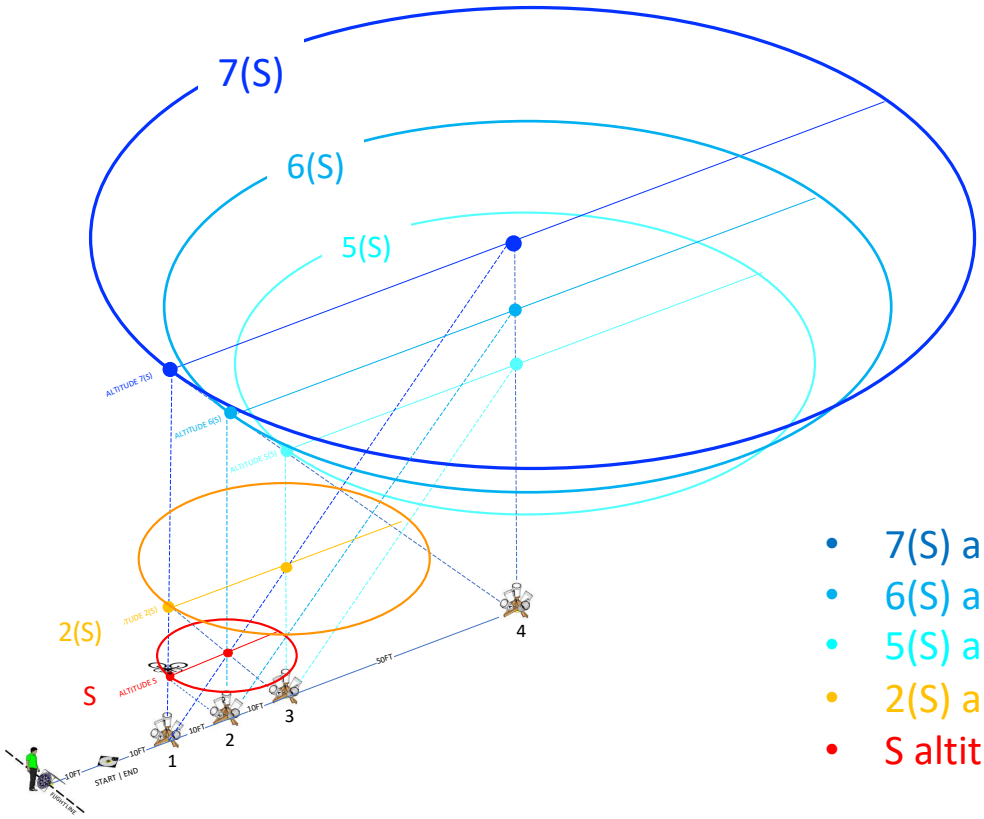
ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS

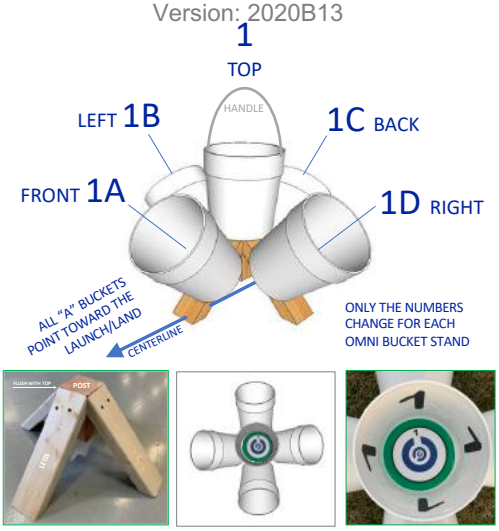


Available Altitudes in Every Scale Lane



- 7(S) altitude
- 6(S) altitude
- 5(S) altitude
- 2(S) altitude
- S altitude

WHITE BUCKETS & GREEN RINGS IN STANDARD TEST LANES



BLACK BUCKETS & COLOR RINGS EMBEDDED INTO SCENARIOS

White buckets are used in the standard test lanes. White or black buckets are used in scenarios. Black buckets hide better in shadows for search tasks. All top buckets are numbered inside so clearly visible from all directions. All angled buckets are lettered A-B-C-D in a leftward (clockwise) direction. This is similar to how firefighters and police designate the sides of houses. The stands need to be level to each other, so the angled buckets at 45 degrees point to locations directly over the nearest bucket stand along the centerline.

Fabrication

Each lane uses (4) omni bucket stands, a Launch/Land Platform, and a measuring tape centerline. The parts required to construct a lane include the following. See the online USAGE GUIDE for fabrication details and pointers:

[04] 10x10x15cm (4x4x6in) center post
[16] 5x10x30cm (2x4x12in) legs with 45deg tapers both ends
[50] 7.5cm (3in) screws to affix the legs (2 per leg at top)
[50] 4 cm (1-1/2in) screws to affix the buckets (2 per bucket)
[20] 7.5-l (2-gal) buckets with 20cm (8 in) diameter bottoms
[52] 20cm (8 in) diameter weatherproof polyester stickers. Download and print the stickers from the USAGE GUIDE
[16] Big numbers 1-1-1-1 inside each top bucket
[16] Big letters A-B-C-D around each top bucket
[15] Acuity targets 1A-1B-1C-1D inside bottom of all
[02] Perch acuity targets inside and under 1A only
[03] Launch/Land stickers (center, project logo, NIST logo)

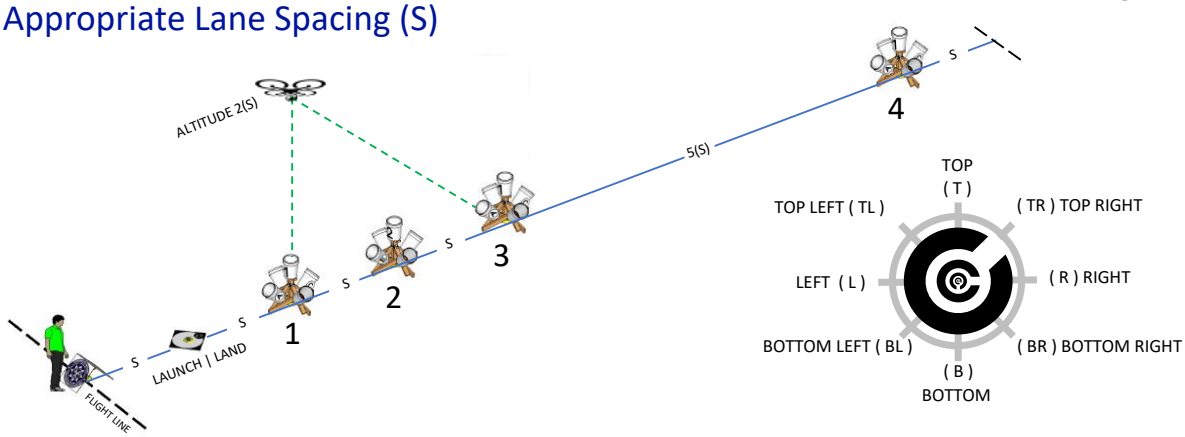
LEAVE THE TOP BUCKET HANDLE TO CARRY THE STAND

Stand #1 Bucket 1A also has the Perch targets P1 and P2 facing the Launch/Land Platform as shown. The P1 target is inside 1A on the interior top and P2 is on the exterior bottom to represent an underbody object of interest.

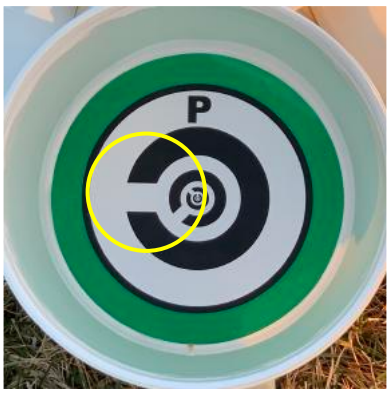
Optional Leveling for Uneven Ground:

[01] Post level to orient stand to vertical
[16] Furniture leveling feet with threaded adjustment for
or
[16] VELCRO 2.5x10x30cm (1x4x12in) extensions under the legs to compensate for uneven terrain. Place a block under the stand post to raise all four legs off the ground. Tip it to level and extend all four legs to the ground.
or
[16] Slotted leg extensions with hanger bolts enable sliding adjustment with wing nuts to secure when level.

Choose Appropriate Lane Spacing (S)



An appropriate lane spacing is when a 2(S) hover allows reading at least the outer concentric C target two stands away.



LEFT) Stickers inside each bucket have a GREEN INSCRIBED RING to guide alignment and a visual acuity target with increasingly small Concentric Cs gaps to identify the correct (1 of 8) random orientations. CENTER) This is close enough to be certain of a completely inscribed GREEN ring and the largest visual acuity gap orientation. CENTER) RIGHT) The bucket target should appear to be at least 1/10 of the overall display width or larger.

Circuit Training with Scores

Open Test Lane

BASIC MANEUVERING

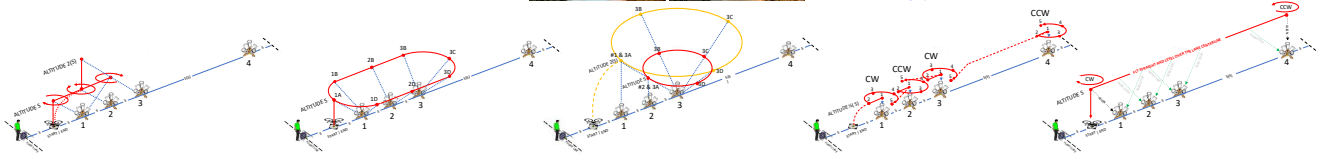
ALIGN WITH BUCKETS

Align with 20 buckets long enough to capture a single image (NO ZOOM) showing a continuous green ring inside the bucket to determine alignment. The numbers/letters are bucket identifiers.

PAYLOAD FUNCTIONALITY

IDENTIFY ACUITY TARGETS

Align with 20 buckets long enough to capture a single alignment image (NO ZOOM) and a single acuity image (MAX ZOOM) to identify the 5 increasingly small Concentric C gap directions.

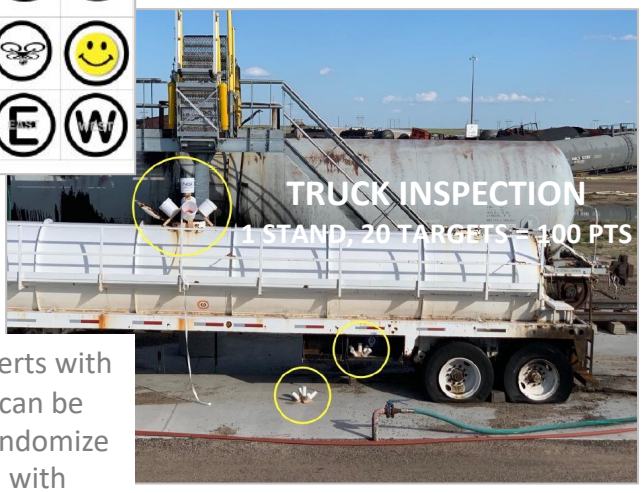


Position	Traverse	Orbit	Inspect	Recon
MAN/PAY 1	MAN/PAY 2	MAN/PAY 3	MAN/PAY 4	MAN/PAY 5
• Hover stably • Basic maneuvers • Landing accuracy • 20 alignments in 1 lap	• Fly sideways along a line • Left and right directions • Landing accuracy • 20 alignments in 2 laps	• Orbit to identify objects • Left and right directions • S and 2(S) altitudes • 20 alignments in 4 laps	• Fly freely to inspect objects • Any proximity (use zooms) • Any altitude • 20 alignments in 1 lap	• Sustain speed over a line • Establish hovers over objects • S altitude, 160(S) distance • 20 alignments in 5 laps
MAN: Align only 5 minutes / 100 points	MAN: Align only 5 minutes / 100 points max	MAN: Align only 5 minutes /100 points	MAN: Align only 5 minutes / 100 points	MAN: Align only 5 minutes / 100 points
PAY: Align and Identify 10 minutes / 100 points	PAY: Align and Identify 10 minutes / 100 points	PAY: Align and Identify 10 minutes / 100 points	PAY: Align and Identify 10 minutes / 100 points	PAY: Align and Identify 10 minutes / 100 points

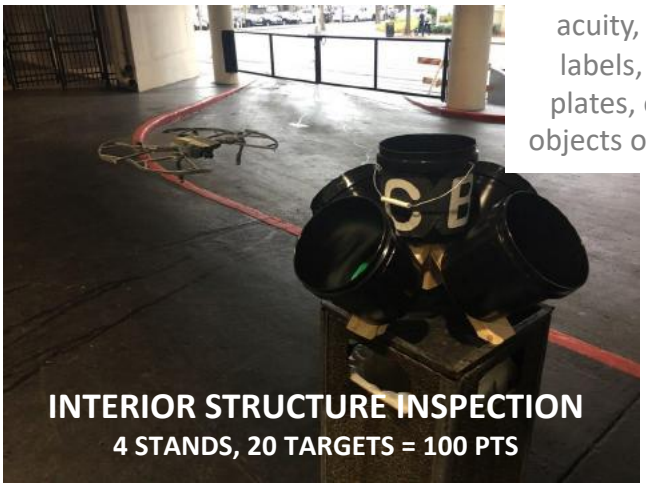
500 PTS

500 PTS

Scenarios with Embedded Scoring



Bucket inserts with stickers can be used to randomize targets with letters, visual acuity, hazmat labels, license plates, or other objects of interest.



Time Limited Trials

Time limited trials are NOT intended to make the tests races. The emphasis should always be on performing each task successfully until the trial is complete. But adding a count-up timer and capturing a statistically significant sample of tasks can enable easy comparison with other pilots or regional averages. You can directly compare scores using similar aircraft on similar tests with similar time limits.

Time limited trials of 5 or 10 minutes each ensures the overall training or evaluation is completed in a deterministic amount of time across multiple tests and scenarios. They can also protect novice pilots from excessive fatigue when they're just not very efficient yet.

The time limits should be ample for an "expert" pilot provided by the manufacturer to complete a trial with a perfect score. They're presumably exhibiting the 100th percentile of proficiency on that system. So the time limits can vary for different systems with different capabilities if necessary.

If a perfect score is completed within the time limit, record the elapsed time as a point of comparison. The average elapsed time of a series of perfect trials can be used to identify the more efficient systems or pilot techniques.

If using a time limit as a Pass/Fail threshold, it should be long enough that a passing pilot can perform at least 10 tasks with a perfect score, which is half a trial. Allowing enough time to complete the entire trial provides more confidence in the resulting system capability or pilot proficiency.

Metrics

Test trials shall produce enough successful repetitions to measure the system capability or remote pilot proficiency with reliability and confidence. There are three performance metrics to consider in order.

1) Completeness (Primary)

If you can't finish a trial without faults, just keep track of how far into the trial sequence you get until you're reliably finishing the trials.

Completion of a statistically significant set of repetitions, twenty or more, is essential to measure the reliability of the task being performed. So a complete trial with twenty task repetitions should be performed to score the trial.

2) Score (Secondary)

For complete trials with 20 task repetitions, the Score is the total of all points earned.

To determine your proficiency, track your scores over time and calculate the average of the most recent five trials. That running average can be compared to others using similar systems in similar test lanes.

Average Score (pts) = (total points in last 5 trials) / 5

3) Efficiency (Tertiary)

If two systems or pilots are consistently completing trials, and their Average Scores are perfect, then the Efficiency can help identify the most effective system or pilot techniques.

The elapsed time of the trials in seconds needs to be tracked as well to calculate the average elapsed time of the last 5 trials.

Average Time (s) = (total seconds of last 5 trials) / 5

The Efficiency, or average rate of successful task completion can then be calculated:

Efficiency (pts/s) = Average Score / Average Time

Trial Forms

The forms are intended to help track and compare performance over time. There are two ways to record the results of a trial:

1) During the trial using the pilot's verbal declarations to a visual observer that also fills in the form.

2) After the trial using images captured at each alignment task. This is how pilots can quickly score their own trials and save documentation to support a credentialing program.

If doing the latter, be aware that images (not video) captured on the aircraft and displayed on secondary monitors may have a BETTER IMAGE QUALITY than that of the pilot using the system interface during the trial. Issues including screen size, glare, distraction, etc. can affect scores. The results should not be compared to one another. There is a check box on the form to identify which approach is being used.

Anybody can watch POV trial video or review the captured images to practice filling in forms.

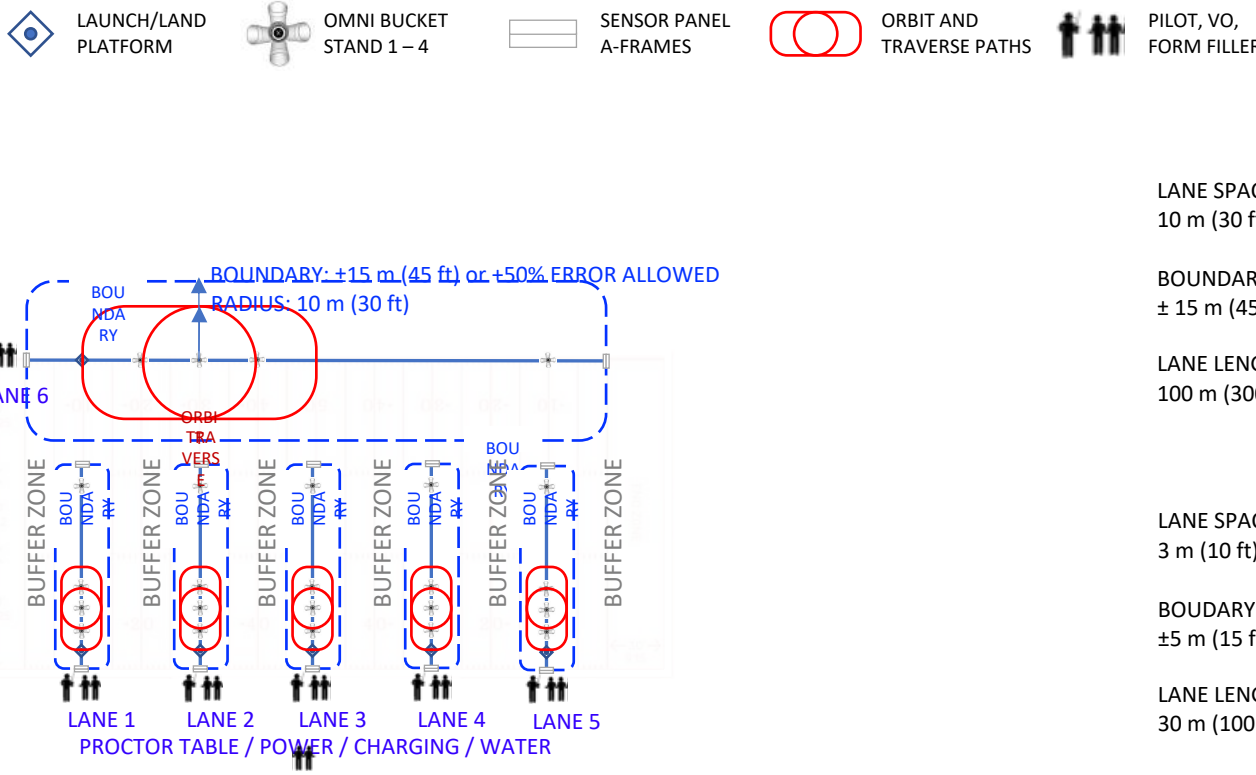
Concurrent Training and Evaluations

FOOTBALL FIELD LAYOUT

A football field is ideal for hosting concurrent training and evaluation exercises. The yard lines enable quick and easy setup using the yard lines as centerlines. They also provide easy to judge boundaries and clear buffers zones between lanes. The number of lanes needed depends on the number of pilots involved. Generally a maximum of 3-4 pilots per lane can be teamed up to help each other conduct their trials and "attest" to each other's scores. The roles at each lane include Pilot, Visual Observer, and Form Filler with an option for an extra Boundary Judge and Battery Retriever. Rotate in 5-minute or 10-minute trials so everybody flies and learns about the test method procedure, forms, and best practices for success.

As shown below, at least five concurrent lanes can be set up with 3 m (10 ft) spacing between bucket stands and 30 m (100 ft) overall lengths. Football fields are about 50 m (160 ft) wide. All lanes start along **one sideline as a clearly defined flightline**. Each lane is then safe to conduct trials independent from the others. Each lane typically needs a big digital clock (preferably synced), a small whiteboard to write the Lane #, Make, Model, Config, and Pilot Code, a table, and 3-4 chairs.

The Admin station should be placed centrially along the sideline, hopefully near power for battery charging. If not, a generator will be needed. A large whiteboard to post scores is also helpful, use Pilot Codes or initials instead of names. One or two Proctors can administer to all the lanes and receive all the data files on memory sticks (labeled by lane and pilot code). Paper forms books can be handed in when all trials are complete.



Concurrent Training and Evaluations

RODEO FORMAT

Pilot groups help each other safely and objectively capture their own scores and "attest" to each other's scores (like golf). They alternate as pilot, visual observer, and forms filler. Groupings should be selected randomly across training sessions and changed for different phases of competitions. Concurrent test lanes and scenarios increase throughput to accommodate more pilots. A plan for 5 groups of 3 pilots is below:

Standard Test Lanes:

- Each lane includes 5 test methods totaling either 100 points for MAN tasks or 500 points for PAY tasks.
- Each test contains 20 visual acuity targets with 5 increasingly small gaps totaling up to 100 points.

Embedded Test Scenarios

- Each scenario includes embedded standard scoring apparatuses and other optionally significant tasks.
- Embedded apparatuses contain 20 visual acuity targets with 5 increasingly small gaps totaling up to 100 points.
- Operationally significant tasks get similar targets to track scoring another 100 points.
- Score up to 200 points total per scenario in 20 minutes.

STANDARD TEST LANES (PRELIMINARIES):
Individual Lanes Conducted Concurrently

Basic Maneuvering (MAN) series of 5 tests.

- **5 min trials** with quick pilot transitions.
- Each lane takes 1 pilot less than 30 minutes to complete.
- Each lane takes 3 pilots 1-1/2 hours to complete.
- 5 lanes increase throughput to 15 pilots in 1-1/2 hours.
- Track scores for each test and totals for all.

Payload Functionality (PAY) series of 5 tests.

- **10 min trials** with quick pilot transitions.
- Each lane takes 1 pilot less than 1 hour to complete.
- Each lane takes 3 pilots 3 hours to complete.
- 5 lanes increase throughput to 15 pilots in 3 hours.
- Track scores for each test and totals for all.

After each round, set a scoring threshold based on performance of all pilots on that day to advance the top half of pilots. Or look for a gap in performance to advance some given the time available. Reset scores to zero between rounds. Pilots fly each subsequent round best score last.

INDIVIDUAL SCENARIOS (SEMI-FINALS):
Conducted Concurrently

- **10 min trials** with quick pilot transitions.
- 5 pilots complete 1-3 scenarios in 1 hour.
- 10 pilots complete 2 scenarios in 2 hours.
- 15 pilots complete 3 scenarios in 3 hours.
- Track scores for each scenario and total for all.

SEQUENCED SCENARIOS (FINALS):
Staggered starts from the same launch point

Perform a sequence of the same scenarios in some prescribed order during a longer duration trial with everybody starting from the same point with staggered start times (everybody needs their own aircraft).

Each pilot spends the same amount of time in each scenario, then moves on to the next scenario when each increment of time expires. Eventually all scenarios are active simultaneously. Total score across all three scenarios wins.

- **20 min trials** across 3 sequential scenarios.
- 10 min start/advance times (00, 10, 20…)
- 5 pilots complete the sequence in 1 hour.
- 10 pilots complete the sequence in 2 hours.
- Track scores for the sequence.

AWARDS:

- Place Awards: 1st, 2nd, 3rd overall score per aircraft system or similar aircraft class.
- Best-in-Class pilots per aircraft class, per test method, or per scenario.

CREDENTIALING:

Proctors need to set up the test lanes and scenarios correctly. Then observe portions of everybody's trials, answer questions, and collect the resulting images and forms. Proctors can also "attest" to the scores after-action based on the time-stamped images captured during trials. The resulting forms and images should be stored centrally in any case. The Proctor can also ensure individual pilot scores are in line with averages from the previous 5 training days captured similarly over time. Graphs of the running averages are very helpful for identifying strengths and weaknesses.

Select Trial Settings for Different Flight Credentials

SET YOUR OWN MINIMUM THRESHOLDS

CREDENTIALS	Daylight/LOS	BVLOS	Night Ops
Standard Lane (Indoor or Outdoor)	Pilot's Eyes On (Available)	Pilot's Back Turned (Interface Only)	Lights Out, Buckets Lit
Embedded Scenario (Indoor or Outdoor)	Pilot's Eyes On (Available)	Pilot's Back Turned (Interface Only)	Lights Out, Buckets Lit

DAYLIGHT / LOS

1) Select test lane and related scenarios based on the intended environment and aircraft capabilities:
   – **Open**
   – **Obstructed**
   – **Indoor**

2) Select test procedure and time limit based on the intended mission:
   – **MAN (5 min. each)**
   – **PAY (10 min. each)**

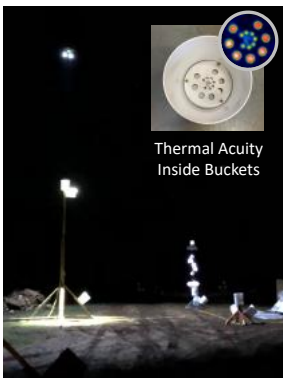
3) Select minimum proficiency based on average and "expert" scores within the same time limit:
   – **Example: 40%, 60%, 80% of "expert"**

ADDITIONAL

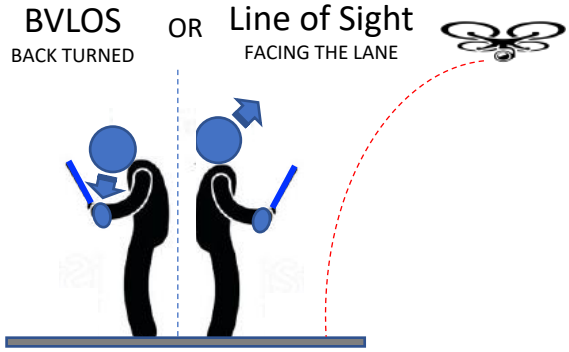
4) Select the pilot view :
   – **Line of Sight or BVLOS (back turned)**

5) Select lighting (indoor or outdoor) for daylight or night credentials:
   – **Lighted/Daylight or Dark**

ILLUMINATED BUCKETS OR PROVIDE POSITIONING AIDS LIKE A WINDOWS IN A HOUSE OR STREET LIGHTS.



OR ILLUMINATE GROUND TARGETS FROM THE AIRCRAFT.

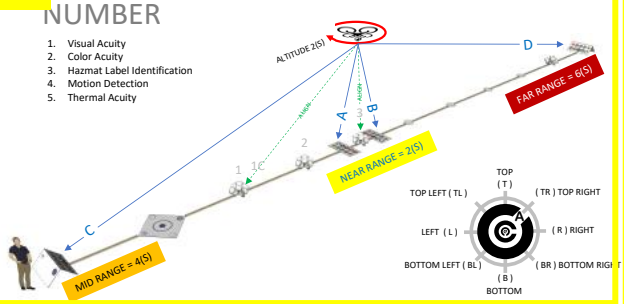


FLYING WITH THE PILOT'S BACK TURNED TO THE LANE FORCES RELIANCE ON THE INTERFACE FOR ALL SITUATIONAL AWARENESS. THIS OPTION REQUIRES A VISUAL OBSERVER.

A TEST NAME

NUMBER

1. Visual Acuity
2. Color Acuity
3. Hazmat Label Identification
4. Motion Detection
5. Thermal Acuity



B

5 POINTS

1 POINT

1 POINT

C

Make: _____

Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

D

LANE SPACING S

~~10~~ FT 20 FT 30 FT

_____ FT

(CIRCLE ONE OR FILL IN)

E

LIGHTING

LIGHT	LIGHTED	DARK
1000+ LUX	300+ LUX	< 1 LUX

(CIRCLE ONE)

F

WIND

RAGE GUSTS

_____ MPH _____ MPH

(FILL IN)

G

PILOT VIEW

S ON AVAILABLE

BVLOS INTERFACE ONLY WITH BACK TOWARD LANE AND V.O.

(CIRCLE ONE)

H

IME LIMIT

~~5~~ MIN 10 MIN _____ MIN

I J K

	PROCEDURE | POSITION	CIRCLE WHEN ALIGNED	CIRCLE GAP DIRECTION WHEN CORRECT				
	CAPTURE IMAGE OF CLOCK – LAUNCH FROM PLATFORM						
1	**HOVER AT ALTITUDE (S) OVER STAND 1**	1	T	BL	TR	BR	TL
2	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	2A	L	R	TR	BL	L
3	**ROTATE LEFTWARD 360°**	1	T	BL	TR	BR	TL
4	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	2A	L	R	TR	BL	L
5	**ROTATE RIGHTWARD 360°**	1	T	BL	TR	BR	TL
6	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	2A	L	R	TR	BL	L
7	**CLIMB TO ALTITUDE 2(S)**	1	T	BL	TR	BR	TL
8	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	3A	B	L	T	BL	TL
9	**DESCEND TO ALTITUDE (S)**	1	T	BL	TR	BR	TL
10	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	2A	L	R	TR	BL	L
11	**FORWARD OVER STAND 2**	2	R	L	B	R	T
12	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	3A	B	L	B	L	BR
13	**BACKWARD OVER STAND 1**	1	T	BL	TR	BR	TL
14	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	2A	L	R	TR	BL	L
15	**FORWARD OVER STAND 2 AND ROTATE RIGHT 180°**	2	R	R	T	L	B
16	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	1C	T	BL	T	TR	R
17	**FORWARD OVER LANDING AND ROTATE LEFT 180°**	LANDING	T	R	B	R	BR
18	ALIGN/IMAGE DOWNWARD THEN FORWARD IN ORDER	1A	B	TL	TR	BL	BR
19	**LAND CENTERED FACING STANDS** (WORTH 2 POINTS)	CENTERED | PERCH 1	B	TL	TR	BL	BR
20	IMAGE FORWARD PERCH TARGETS P1/P2 IN ORDER	CENTERED | PERCH 2	L	R	TR	BL	L
	LAND CENTERED FACING DOWN RANGE – CAPTURE IMAGE OF CLOCK -- END OF TRIAL						

IF A FAULT OCCURS, STRIKE THROUGH THE ENTIRE TRIAL AND CIRCLE THE REASON: APPARATUS GROUND BOUNDARY SAFETY

L

SOURCE

PILOT (CIRCLE ONE) IMAGES

M

MANEUVERING SCORE

TOTAL ALIGNED

of 20

RELIABILITY

(TOTAL ALIGNED / ATTEMPTED) X 100

%

EFFICIENCY

TOTAL ALIGNED / MINUTES

RATE

N

PAYLOAD SCORE

TOTAL GAPS

of 100

AVERAGE ACUITY

TOTAL GAPS / TOTAL ALIGNED

RINGS

EFFICIENCY

TOTAL GAPS / MINUTES

RATE

O

Form Fill-In Guidance

SCORE DURING FLIGHT OR AFTER TRIAL USING CAPTURED IMAGES

A) Test Name: Select the test form as indicated by the test name, ASTM International standard or work item number, and graphic lane overview. Use the written procedure and a timer to practice informal trials by simply counting the number of buckets successfully completed within the time limit. When several timed practice trials result in similar scores, conduct a formal trial and record the score by completing the entire form with a visual observer to "attest" and sign the back.

B) Markings: Ensure the pilot understands that a successful bucket alignment shows the green ring with an unbroken inner black edge. Successful bucket alignments, partial alignments, and correct gap orientations get circled for points. Missed alignments and incorrect gap orientations get slashed through for zero points. The circles can be summed quickly after the trial to calculate the score. Slashes may be cause for a failed trial depending on the minimum threshold set by your local organization.

C) Trial Info: Fill in all the key information about the aircraft system being used so that similar systems can be identified for comparison purposes. These include the make, model, configuration (payload, zoom, interface, etc.), personnel, and facility, date, time, and lane number if using concurrent lanes.

D) Lane Spacing: Circle one of the typical LANE SPACING dimensions used or write in your own. Scores should only be compared in similar size lanes. If in a scenario, use this box to identify the name or location of the scenario to differentiate it from similar scenarios.

E) Lighting: Circle one of three lighting conditions used during the trial. Scores should only be compared in similar lighting conditions. DAYLIGHT is considered any outdoor daytime environment. LIGHTED is considered indoor office lighting. DARK is considered outdoor or indoor conditions that are just barely comfortable to walk around without a light.

F) Wind: Fill in the average wind and maximum gusts recorded during the trial. Scores should only be compared in similar wind conditions. The similarity can be rather course, such as within 10 mph lanes. Indoor basketball courts, hockey arenas, or tennis bubbles provide shelter from the environment and are generally available nationwide.

G) Pilot View: Circle EYES ON when the pilot is facing the lane with a direct view of the aircraft, even if assisted by a Visual Observer and conducting the trial mostly through the interface. Circle BVLOS when the pilot has their back toward the lane without a direct view of the aircraft. This shall always be done with assistance from a Visual Observer and can represent situations where the aircraft flies behind a building or treeline for extended periods with a Visual Observer placed down range in constant contact with the pilot.

H) Time Limit: Circle the trial time limit being used as either 5 minutes, 10 minutes, or other. Scores should only be compared in trials with similar time limits. If an organization uses the time limit as a threshold for pass/fail, the entire trial should be completed within that time limit and the actual elapsed time (less than the available time limit) does not need to be calculated.

I) Procedure: Follow the test method procedure as shown. Each line is a command communication that can be translated into different languages. If the V.O. is announcing each step, nothing more should need to be said.

J) Bucket Alignments: Circle the green bucket identifiers when successfully aligned. Slash through them when missed. These can be scored either by a Visual Observer or after the trial using the captured images of each bucket and target.

K) Gap Directions: Circle the blue bucket identifiers when Concentric C gap directions are correct. Slash through them when incorrect. These can be scored either by a Visual Observer or after the trial using the captured images of each bucket and target.

L) Pilot or Images: Circle one depending on the scoring source, either live via the interface or after the trial using captured images.

M) Maneuvering Score: Fill in the totals and calculate the results as described.

N) Payload Score: Fill in the totals and calculate the results as described.

O) Fault Conditions: Circle one if applicable as cause for an end of trial due to safety concerns.

Point and Zoom Cameras

SENSING 1-5

Purpose:

This test evaluates remotely piloted aircraft camera pointing and zooming capabilities using sensor targets at various distances from a designated hover position and altitude. This test can be used to measure aircraft sensors including visual acuity, color acuity, thermal acuity, motion detection, hazmat label identification, etc. This test can also be used as a repeatable training task to practice the system interface and evaluate remote pilot proficiency for credentialing.

Summary of Test:

The pilot operates within line of sight of the lane and aircraft or with their back turned to the lane to represent flying beyond visual line of sight (BVLOS) with a visual observer (VO) to ensure safety. The aircraft maintains a designated position and altitude while identifying sensor target panels at different distances below and around the aircraft. Each sensor target panel displays a row of five Concentric C visual acuity targets and color acuity rings. There are also five operationally significant tasks for motion detection (rotating), hazardous material label identification, partial license plates or gauges to read, thermal acuity targets, or others.

The lane Spacing (S) is scalable so the panels can be set to distances that exceed the aircraft capabilities. Panels A and B are directly below the aircraft at 2(S) distance, so even systems without zoom capabilities have access to 50% of the points available in the chosen lane spacing. Panel C is up-range at 4(S) distance. Panel D is down-range at 6(S) distance. The aircraft rotates 180 degrees between each sensor panel identification to ensure each repetition involves the same camera pointing and zooming tasks.

There is a *Quick* procedure and a *Comprehensive* procedure. Both score up to 100 points if all concentric Cs can be correctly identified. The metrics include *Completeness* of the trial, *Points* for overall acuity, *Reliability* as the percent of successful tasks performed, and *Efficiency* as the rate of successful tasks performed. Results should only be compared across test lanes with similar Spacings (S).

1. Visual Acuity
2. Color Acuity
3. Hazmat Label Identification
4. Motion Detection
5. Thermal Acuity

*If your aircraft camera has a limited range of motion, align with as many targets as possible. Pilot proficiency should only be compared using similar aircraft.

Point and Zoom Cameras

SENSING 1-5

Procedure

- Start in a stable hover over Stand 3 at altitude 2(S).
- Align with Buckets 3 and 1C to verify position and altitude.
- Capture images of all target identifications using either procedure below:

- ***Quick: 4 different objects (panels) around the aircraft, each with 5 features to identify (acuity targets).***
  This is a quick test that all systems and pilots should perform no matter the zoom capabilities of the aircraft. It can be used to ensure the aircraft is in an appropriate lane Spacing (S).
  1. Identify ALL TARGETS on **Panel A** then **rotate 180°** to identify ALL TARGETS on **Panel B** and so on.
  2. Target sequence: **A1** – **A2** – **A3** – **A4** – **A5** (ROTATE) **B1** – **B2** – **B3** – **B4** – **B5** (ROTATE) **C1** – **C2**…
  3. Continue through panels **A, B, C, D** in sequence with **180° rotations between panels** until all 20 targets have been completed or the trial time expires.

- ***Comprehensive: 20 different objects to identify (acuity targets) around the aircraft.***
  This is a comprehensive test is used to fully evaluate either system capabilities or remote pilot proficiency. It is typically conducted without a set time limit.
  1. Identify a SINGLE TARGET on **Panel A** then **rotate 180°** to identify a SINGLE TARGET on **Panel B**, and so on alternating rotations and target identifications.
  2. Target sequence: **A1** (ROTATE) **B1** (ROTATE) **C1** (ROTATE) **D1** (ROTATE) **A2** (ROTATE) **B2** (ROTATE)…
  3. Continue through panels **A, B, C, D** in a repeating sequence with 180° rotations between each target until all 20 targets have been identified or the trial time expires.

Metrics (in order of priority)

1. *Completeness* = the number of target identifications performed
2. *Points (Overall Acuity)* = number of successfully identified Concentric Cs (Assuming a *Complete* trial)
3. *Reliability* = (points / attempts) x 100 = ____ %. (Assuming a *Complete* trial)
4. *Efficiency* = points / elapsed time = ____ points/minute (Assuming a *Complete* and *Reliable* trial)

Form Fill-In:

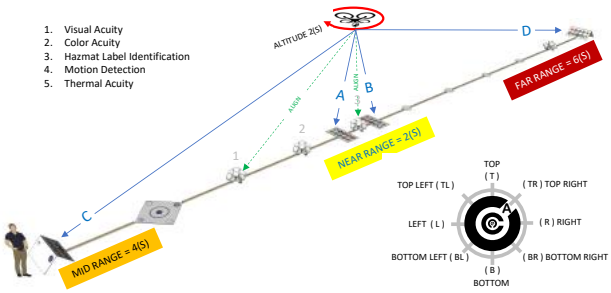
- Circle the IDENTIFIER (shown in green) for successfully aligned targets, or strike through it if missed.
- Circle the GAP DIRECTION (shown in blue) for correctly identified gaps, or strike through it if missed.
- Circle the FAULT (shown in red) if there is any contact with the apparatus, ground, or safety enclosure. Or if the aircraft leaves the lane for any reason. Faults force an end of trial for safety concerns.

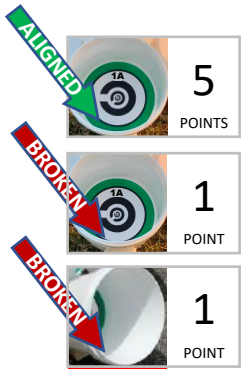
Point/Zoom Cameras

SEN 1-5

ALTITUDE 2(S)

1. Visual Acuity
2. Color Acuity
3. Hazmat Label Identification
4. Motion Detection
5. Thermal Acuity





Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH (FILL IN)	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

PROCEDURE | POINT AND ZOOM CAMERAS		FORMS ANSWER KEY VERSION 2020B					SOURCE: PILOT	IMAGES	VIDEO		
START THE TIMER -- LAUNCH FROM PLATFORM	TARGET ID	CIRCLE THE RING GAP DIRECTION WHEN CORRECT. DON'T GUESS! IF INCORRECT, STRIKE THE ENTIRE LINE!					COLOR ACUITY	MOTION DETECTION	HAZMAT LABELS	LICENSE PLATES	MISC OBJECTS	THERMAL DIRECTION
1 HOVER OVER STAND #3 AT 2(S) VIEWING UP RANGE	A1	T	BL	R	BR	L		A				
2 ALIGN WITH BUCKETS #3 & 1C	A2	TR	B	TR	L	BR						
3 READ NEAR RANGE PANEL "A"	A3	R	TL	T	BL	B		NONE				DRAW IT
4 TOP ACUITY ROW FIRST, LEFT TO RIGHT	A4	BR	R	TL	L	BR		C-W				
5 BOTTOM OBJECT ROW, LEFT TO RIGHT	A5	B	TL	R	BL	T		C-C-W				
6 ROTATE 180° VIEWING DOWN RANGE	B1	BL	T	BR	R	TL		B				
7 MAINTAIN HOVER POSITION	B2	L	BR	T	TL	R						
8 READ NEAR RANGE PANEL "B"	B3	TL	R	TL	L	BR		NONE				DRAW IT
9 TOP ACUITY ROW FIRST, LEFT TO RIGHT	B4	T	BL	R	TL	B		C-W				
10 BOTTOM OBJECT ROW, LEFT TO RIGHT	B5	TR	B	TL	B	BL		C-C-W				
11 ROTATE 180° VIEWING UP RANGE	C1	R	TL	B	BL	R		C				
12 ALIGN WITH BUCKETS #3 & 1C	C2	BR	T	TL	R	BL						
13 READ MID RANGE PANEL "C"	C3	B	TR	R	BL	T		NONE				DRAW IT
14 TOP ACUITY ROW FIRST, LEFT TO RIGHT	C4	BL	R	BL	T	BR		C-W				
15 BOTTOM OBJECT ROW, LEFT TO RIGHT	C5	L	TL	R	BR	T		C-C-W				
16 ROTATE 180° VIEWING DOWN RANGE	D1	TL	B	TR	R	BR		D				
17 MAINTAIN HOVER POSITION	D2	T	BL	B	TR	L						
18 READ FAR RANGE PANEL "D"	D3	TR	L	BL	R	TL		NONE				DRAW IT
19 TOP ACUITY ROW FIRST, LEFT TO RIGHT	D4	R	BL	T	TR	B		C-W				
20 BOTTOM OBJECT ROW, LEFT TO RIGHT	D5	BR	B	TL	B	TR		C-C-W				
LAND ON PLATFORM -- STOP THE TIMER -- END OF TRIAL	TARGET ID	CORRECT RINGS FOR THE GIVEN LANE SPACING. RESULTS ARE NOT COMPARABLE WITH OTHER LANE SPACINGS.					CORRECT COLORS	CORRECT MOTIONS	CORRECT HAZMATS	CORRECT LICENSES	CORRECT OBJECTS	CORRECT THERMALS
		TOAL CORRECT RINGS: /100					/20	/4	/4	/4	/4	/4

Point and Zoom Cameras

SENSING 1-5

Target#	Trial Notes
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

SIGNATURES “ATTESTING” THE SCORES ARE CORRECT

_____	_____	_____
PILOT NAME	ORGANIZATION	SIGNATURE
_____	_____	_____
VISUAL OBSERVER NAME	ORGANIZATION	SIGNATURE
_____	_____	_____
OTHER NAME	ORGANIZATION	SIGNATURE
_____	_____	_____
PROCTOR NAME	ORGANIZATION	SIGNATURE

Open Lane: Position

MAN/PAY 1

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

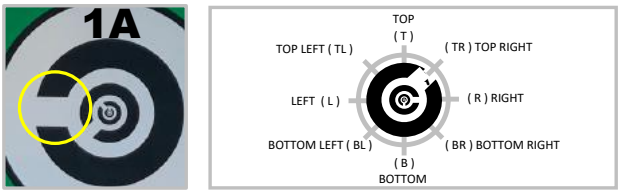
20 ALIGNMENTS TOTAL UP TO 100 POINTS

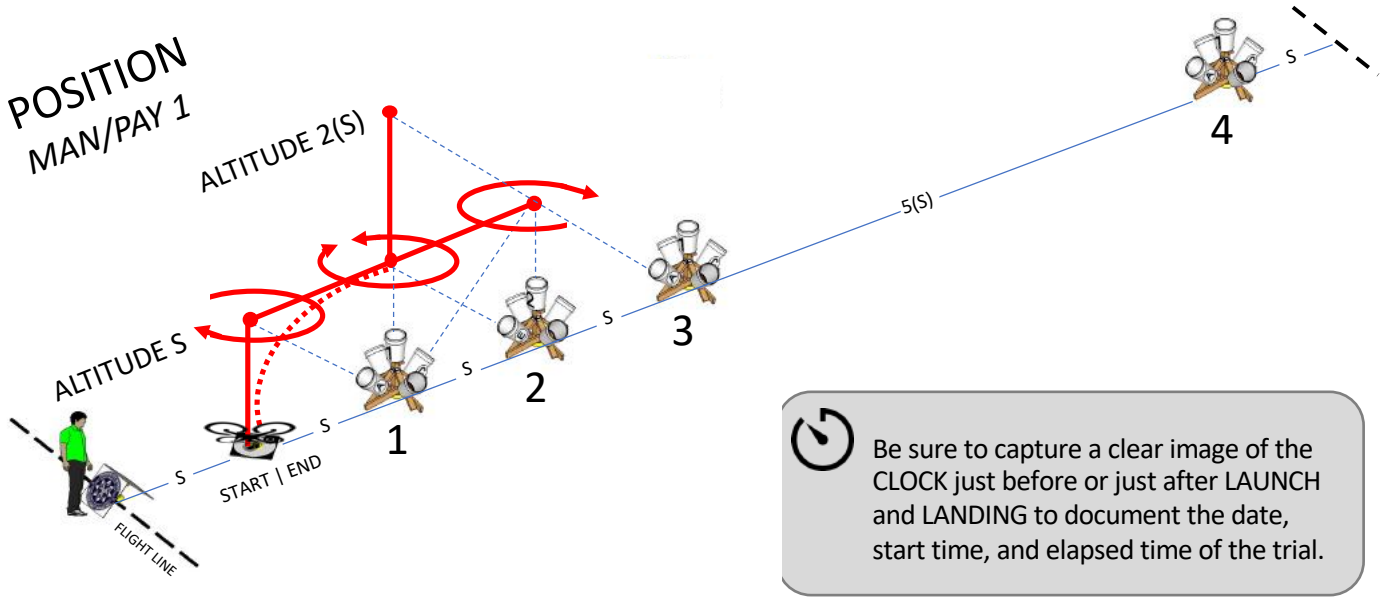
Payload Functionality (PAY)

ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS





Be sure to capture a clear image of the CLOCK just before or just after LAUNCH and LANDING to document the date, start time, and elapsed time of the trial.

*If your aircraft camera has a limited range of motion, align with as many targets as possible. Pilot proficiency should only be compared using similar aircraft.

Open Lane: Position

MAN/PAY 1

SUMMARY

Position trials evaluate basic flight maneuvers between designated hover positions, orientations, and altitudes along the lane centerline to demonstrate positive aircraft control at all times. The drone performs a series of maneuvers including climb, descend, yaw, pitch, and roll to simultaneously align with two buckets in each position, orientation, and altitude. The aircraft then lands centered on the platform with the chassis or any ground contact within a 30 cm (12 in) radius circle. Each alignment requires capturing a single image for scoring after the trial. A complete trial includes 1 lap through 10 positions with 20 designated bucket alignments and landings scoring up to 100 maneuvering points. Separate Payload Functionality scores totaling up to 100 acuity points are based on the number of acuity target gaps correctly identified during each alignment.

METRICS

- ***Score*** = Total alignment points accumulated during a trial (up to 100 points).
- ***Acuity*** = The average number of ring gaps correctly identified during each alignment (based on the zoom capabilities of the drone).
- ***Efficiency*** = The elapsed time of a complete trial (20 alignments) with perfect score (100 points)

SCORING

- **Altitudes**: Perform these trials at altitude (S) with one position at 2(S).
- **Maneuvering Points:** Verbally announce alignment and capture a single no-zoom image of each bucket.
- **Acuity Points:** Verbally announce ring gaps and capture a single max-zoom image of each acuity target.

PROCEDURE:

START THE TIMER and capture a clock image with the drone to record the start time (pre or post launch).

1. HOVER OVER STAND #1 TO SEE BUCKET 2A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 2A to check altitude.

2. YAW LEFT 360º TO SEE BUCKET 2A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 2A to check altitude.

3. YAW RIGHT 360º TO SEE BUCKET 2A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 2A to check altitude.

4. CLIMB VERTICALLY TO SEE BUCKET 3A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 3A to check altitude.

5. DESCEND VERTICALLY TO SEE BUCKET 2A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 2A to check altitude.

6. PITCH FORWARD OVER STAND #2 TO SEE BUCKET 3A.
   – ALIGN WITH BUCKET 2 to check position.
   – ALIGN WITH BUCKET 3A to check altitude.

7. PITCH BACKWARD OVER STAND #1 TO SEE BUCKET 2A.
   – ALIGN WITH BUCKET 1 to check position.
   – ALIGN WITH BUCKET 2A to check altitude.

8. PITCH FORWARD OVER STAND #2 TO SEE BUCKET 3A.
   YAW LEFT 180º TO SEE BUCKET 1C.
   – ALIGN WITH BUCKET 2 (UPSIDE DOWN) tocheck position.
   – ALIGN WITH BUCKET 1C to check altitude.

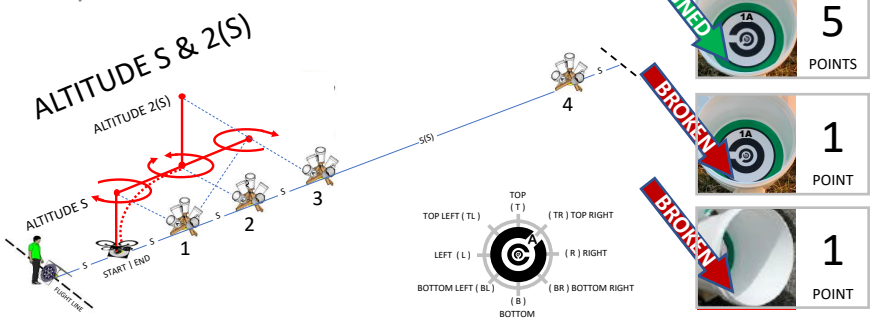
9. PITCH FORWARD TO OVER LAUNCH/LAND (L).
   YAW RIGHT 180º TO SEE BUCKET 1A.
   – ALIGN WITH LAUNCH/LAND (L) to check position.
   – ALIGN WITH BUCKET 1A to check altitude.

10. LAND CENTERED with the chassis or a ground contact within the marked 30 cm (12 in) radius circle.
    – Maneuvering Points: Score 5 points twice (10 points) if landed accurately within the marked circle.
    – Acuity Points: Identify the PERCH (P1) acuity target and PERCH (P2) acuity target in order.

STOP THE TIMER and capture a clock image with the drone to record the end of the trial (pre or post landing).

Open Lane: Position

MAN/PAY 1



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

OPEN LANE | POSITION TEST		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**LAUNCH AND HOVER** OVER STAND #1 TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
2	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	2A: 5pt 1pt 0pt	L	BR	T	TL	R
3	**YAW LEFT 360°** OVER STAND #1 TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
4	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	2A: 5pt 1pt 0pt	L	BR	T	TL	R
5	**YAW RIGHT 360°** OVER STAND #1 TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
6	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	2A: 5pt 1pt 0pt	L	BR	T	TL	R
7	**CLIMB VERTICALLY OVER STAND #1** TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
8	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
9	**DESCEND VERTICALLY OVER STAND #1** TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
10	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	2A: 5pt 1pt 0pt	L	BR	T	TL	R
11	**PITCH FORWARD OVER STAND #2** TO ALIGN WITH	2: 5pt 1pt 0pt	BL	T	BR	R	TL
12	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
13	**PITCH BACKWARD OVER STAND #1** TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
14	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	2A: 5pt 1pt 0pt	L	BR	T	TL	R
15	**PITCH FORWARD OVER STAND #2 THEN YAW LEFT 180°**	2: 5pt 1pt 0pt	TR	B	TL	L	BR
16	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	1C: 5pt 1pt 0pt	BR	R	TL	L	BR
17	**PITCH FORWARD OVER LANDING THEN YAW RIGHT 180°**	L: 5pt 1pt 0pt	B	TR	L	BL	T
18	CAPTURE ONE IMAGE DOWNWARD THEN FORWARD	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
19	**LAND IN CIRCLE** (ONE OR MORE LEGS) – COUNTS TWICE	L: 5pt 0pt	BL	R	TL	L	BL
20	CAPTURE ONE IMAGE OF PERCH P1 THEN PERCH P2	L: 5pt 0pt	L	BR	T	TL	B
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

UNDERLINE MEANS READING UPSIDE DOWN

TARGETS VERSION 2020B

MAN SCORE

TOTAL PONTS (MAX = 100)

EFFICIENCY

MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

PAY SCORE

CORRECT GAPS (MAX = 100)

EFFICIENCY

CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

ATTESTATIONS

PILOT

NAME _____

ORG _____

STATE _____ ZIP CODE _____

EMAIL _____

PHONE _____

PROCTOR OR VISUAL OBSERVER

NAME _____

ORG _____

STATE _____ PROCTOR CODE _____

EMAIL _____

Open Lane: Traverse

MAN/PAY 2

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

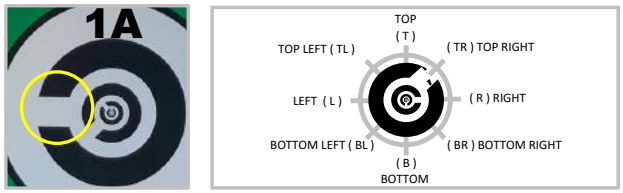
20 ALIGNMENTS TOTAL UP TO 100 POINTS

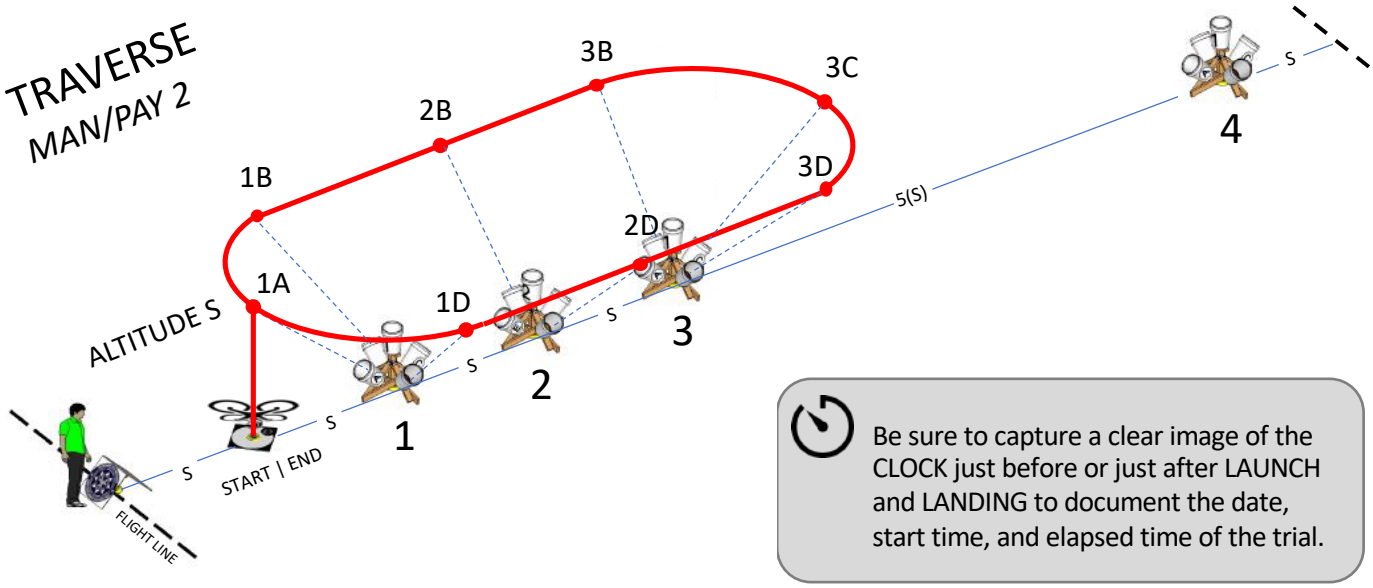
Payload Functionality (PAY)

ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS





Be sure to capture a clear image of the CLOCK just before or just after LAUNCH and LANDING to document the date, start time, and elapsed time of the trial.

*If your aircraft camera has a limited range of motion, align with as many targets as possible. Pilot proficiency should only be compared using similar aircraft.

Open Lane: Traverse

MAN/PAY 2

SUMMARY

Traverse trials evaluate drones **flying sideways parallel to objects while looking forward to identify features** as if along a building, woods line, truck/bus, etc. The drone flies at altitude (S) to complete two laps in both directions around the omni bucket stands to align with the designated buckets. The drone also lands centered on the platform with the chassis or any ground contact within a 30 cm (12 in) radius circle. Each alignment requires capturing a single image for scoring after the trial. A complete trial includes 2 laps with 20 designated bucket alignments and landings scoring up to 100 maneuvering points. Separate Payload Functionality scores totaling up to 100 acuity points are based on the number of acuity target gaps correctly identified during each alignment.

METRICS

- ***Score*** = Total alignment points accumulated during a trial (up to 100 points).
- ***Acuity*** = The average number of ring gaps correctly identified during each alignment (based on the zoom capabilities of the drone).
- ***Efficiency*** = The elapsed time of a complete trial (20 alignments) with perfect score (100 points)

SCORING

- **Altitudes**: Perform these trials at altitude (S) throughout.
- **Maneuvering Points:** Verbally announce alignment and capture a single no-zoom image of each bucket.
- **Acuity Points:** Verbally announce ring gaps and capture a single max-zoom image of each acuity target.

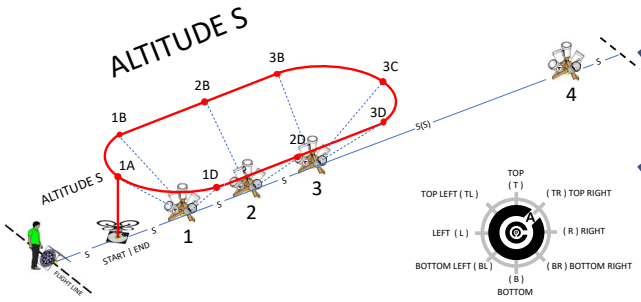
PROCEDURE:

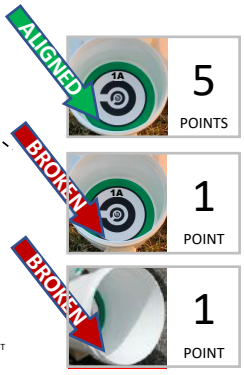
START THE TIMER and capture a clock image with the drone to record the start time (pre or post launch).

1. HOVER AT ALTITUDE (S) OVER THE LAUNCH/LAND.
   – ALIGN WITH BUCKET 1A to check position and altitude.
2. ORBIT 90° LEFTWARD AROUND STAND #1.
   – ALIGN WITH BUCKET 1B to check position and altitude.
3. ROLL LEFTWARD PARALLEL TO THE CENTERLINE TO STAND #2.
   – ALIGN WITH BUCKET 2B to check position and altitude.
4. ROLL LEFTWARD PARALLEL TO THE CENTERLINE TO STAND #3.
   – ALIGN WITH BUCKET 3B to check position and altitude.
5. ORBIT 90° LEFTWARD AROUND STAND #3.
   – ALIGN WITH BUCKET 3C to check position and altitude.
6. ORBIT 90° LEFTWARD AROUND STAND #3.
   - ALIGN WITH BUCKET 3D to check position and altitude.
7. ROLL LEFTWARD PARALLEL TO THE CENTERLINE TO STAND #2.
   - ALIGN WITH BUCKET 2D to check position and altitude.
8. ROLL LEFTWARD PARALLEL TO THE CENTERLINE TO STAND #1.
   - ALIGN WITH BUCKET 1D to check position and altitude.
9. ORBIT 90° LEFTWARD AROUND STAND #1.
   – ALIGN WITH BUCKET 1A to check position and altitude.
10. LAND CENTERED with the chassis or a ground contact within the marked 30 cm (12 in) radius circle.
    – Maneuvering Points: Score 5 points if landed accurately within the marked circle.
    – Acuity Points: Identify the PERCH (P1) acuity target on the inside wall of Bucket 1A.
11. HOVER AT ALTITUDE (S) OVER THE LAUNCH/LAND PLATFORM.
    – ALIGN WITH BUCKET 1A to check position and altitude.
12. ORBIT 90° RIGHTWARD AROUND STAND #1.
    – ALIGN WITH BUCKET 1D to check position and altitude.
13. ROLL RIGHTWARD PARALLEL TO THE CENTERLINE TO STAND #2.
    – ALIGN WITH BUCKET 2D to check position and altitude.
14. ROLL LEFTWARD PARALLEL TO THE CENTERLINE TO STAND #3.
    – ALIGN WITH BUCKET 3D to check position and altitude.
15. ORBIT 90° RIGHTWARD AROUND STAND #3.
    - ALIGN WITH BUCKET 3C to check position and altitude.
16. ORBIT 90° RIGHTWARD AROUND STAND #3.
    – ALIGN WITH BUCKET 3B to check position and altitude.
17. ROLL RIGHTWARD PARALLEL TO THE CENTERLINE TO STAND #2.
    - ALIGN WITH BUCKET 2B to check position and altitude.
18. ROLL RIGHTWARD PARALLEL TO THE CENTERLINE TO STAND #1.
    – ALIGN WITH BUCKET 1B to check position and altitude.
19. ORBIT 90° RIGHTWARD AROUND STAND #1.
    - ALIGN WITH BUCKET 1A to check position and altitude.
20. LAND CENTERED with the chassis or a ground contact within the marked 30 cm (12 in) radius circle.
    – Maneuvering Points: Score 5 points if landed accurately within the marked circle.
    – Acuity Points: Identify the PERCH (P2) acuity target underneath Bucket 1A.

Open Lane: Traverse

MAN/PAY 2





Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

OPEN LANE | TRAVERSE TEST		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**HOVER OVER THE LAUNCH PLATFORM** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
2	**ORBIT 90° LEFTWARD AROUND STAND #1** TO ALIGN WITH	1B: 5pt 1pt 0pt	R	TL	T	BL	B
3	**ROLL LEFTWARD TO STAND #2** TO ALIGN WITH	2B: 5pt 1pt 0pt	TL	R	TR	L	BR
4	**ROLL LEFTWARD TO STAND #3** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
5	**ORBIT 90° LEFTWARD AROUND STAND #3** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
6	**ORBIT 90° LEFTWARD AROUND STAND #3** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
7	**ROLL LEFTWARD TO STAND #2** TO ALIGN WITH	2D: 5pt 1pt 0pt	TR	B	TL	B	BL
8	**ROLL LEFTWARD TO STAND #1** TO ALIGN WITH	1D: 5pt 1pt 0pt	B	TL	R	BL	T
9	**ORBIT 90° LEFTWARD AROUND STAND #1** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
10	**LAND IN CIRCLE** WITH ONE OR MORE LEGS = 5 POINTS	L: 5pt 0pt	B	TR	L	BL	T
	REVERSE DIRECTION						
11	**HOVER OVER THE LAUNCH PLATFORM** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
12	**ORBIT 90° RIGHTWARD AROUND STAND #1** TO ALIGN WITH	1D: 5pt 1pt 0pt	B	TL	R	BL	T
13	**ROLL RIGHTWARD TO STAND #2** TO ALIGN WITH	2D: 5pt 1pt 0pt	TR	B	TL	B	BL
14	**ROLL RIGHTWARD TO STAND #3** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
15	**ORBIT 90° RIGHTWARD AROUND STAND #3** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
16	**ORBIT 90° RIGHTWARD AROUND STAND #3** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
17	**ROLL RIGHTWARD TO STAND #2** TO ALIGN WITH	2B: 5pt 1pt 0pt	TL	R	TR	L	BR
18	**ROLL RIGHTWARD TO STAND #1** TO ALIGN WITH	1B: 5pt 1pt 0pt	R	TL	T	BL	B
19	**ORBIT 90° RIGHTWARD AROUND STAND #1** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
20	**LAND IN CIRCLE** WITH ONE OR MOR LEGS = 5 POINTS	L: 5pt 0pt	B	TR	L	BL	T
START TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

TARGETS VERSION 2020B

MAN SCORE

TOTAL PONTS (MAX = 100)

EFFICIENCY

MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

PAY SCORE

CORRECT GAPS (MAX = 100)

EFFICIENCY

CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

ATTESTATIONS

PILOT

NAME _____

ORG _____

STATE _____ ZIP CODE _____

EMAIL _____

PHONE _____

PROCTOR OR VISUAL OBSERVER

NAME _____

ORG _____

STATE _____ PROCTOR CODE _____

EMAIL _____

Open Lane: Orbit

MAN/PAY 3

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

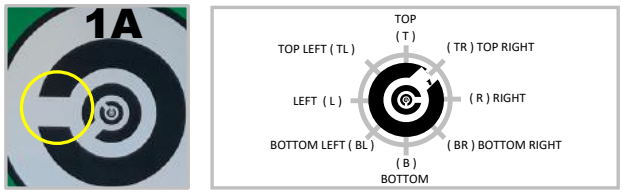
20 ALIGNMENTS TOTAL UP TO 100 POINTS

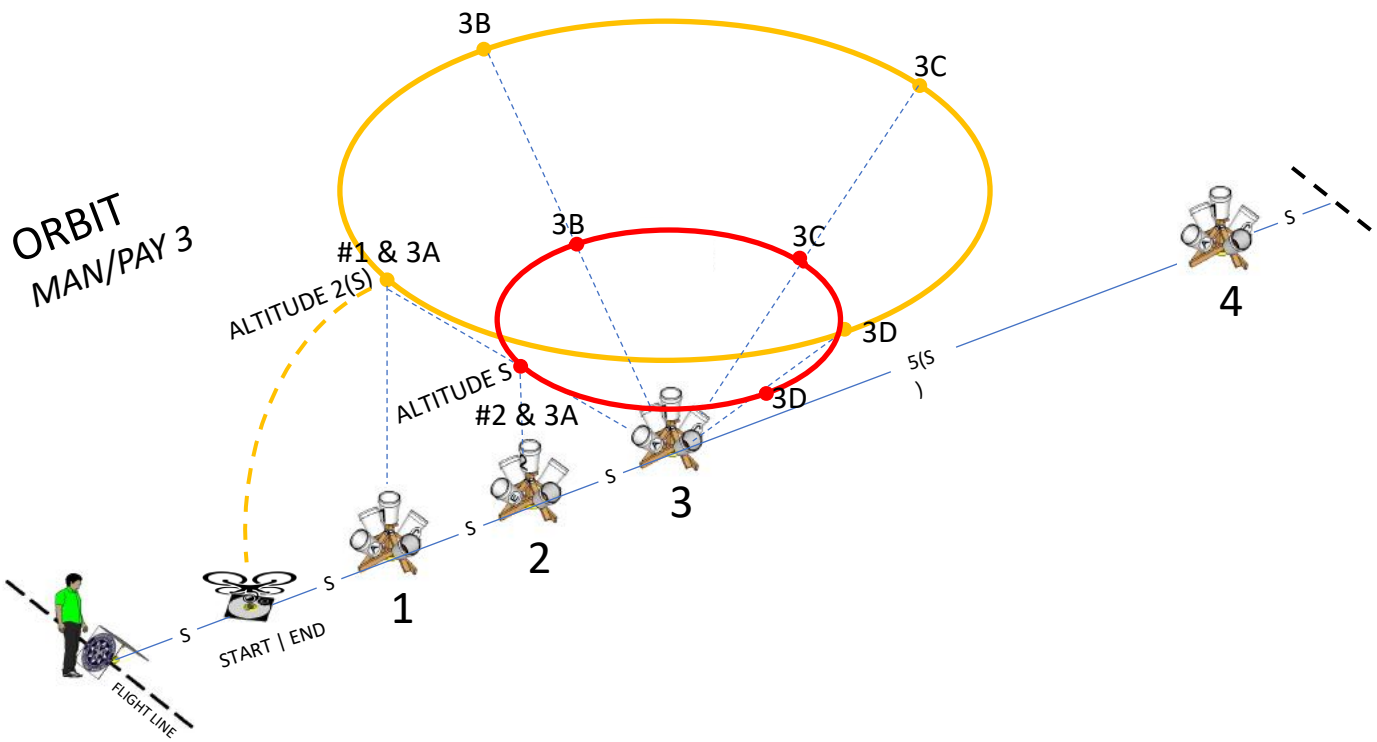
Payload Functionality (PAY)

ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS





Open Lane: Orbit

MAN/PAY 3

SUMMARY

Orbit trials evaluate drones **flying circular flight paths at different altitudes around objects** while looking inward to identify features on all four sides. The drone orbits at altitude 2(S) in both directions then altitude (S) in both directions to align with the designated buckets. Each orbit starts with an initial downward bucket alignment to check the radius before proceeding leftward and rightward. Accurate landings are not included. Each alignment requires capturing a single image for scoring after the trial. A complete trial includes 4 orbits with 20 designated alignments scoring up to 100 maneuvering points. Separate Payload Functionality scores totaling up to 100 acuity points are based on the number of acuity target gaps correctly identified during each alignment.

METRICS

- ***Score*** = Total alignment points accumulated during a trial (up to 100 points).
- ***Acuity*** = The average number of ring gaps correctly identified during each alignment (based on the zoom capabilities of the drone).
- ***Efficiency*** = The elapsed time of a complete trial (20 alignments) with perfect score (100 points)

SCORING

- **Altitudes**: Perform these trials at altitude 2(S) then altitude (S).
- **Maneuvering Points:** Verbally announce alignment and capture a single no-zoom image of each bucket.
- **Acuity Points:** Verbally announce ring gaps and capture a single max-zoom image of each acuity target.

PROCEDURE:

START THE TIMER and capture a clock image with the drone to record the start time (pre or post launch).

1. HOVER OVER STAND #1 AT ALTITUDE 2(S) TO SEE BUCKET 3A.
   ALIGN WITH BUCKET 1 to check the orbit radius.
   ALIGN WITH BUCKET 3A to check altitude.
2. ORBIT 90° LEFTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3B to check the orbit radius and altitude.
3. ORBIT 90° LEFTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3C to check the orbit radius and altitude.
4. ORBIT 90° LEFTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3D to check the orbit radius and altitude.

5. HOVER OVER STAND #1 AT ALTITUDE 2(S) TO SEE BUCKET 3A.
   ALIGN WITH BUCKET 1 to check the orbit radius.
   ALIGN WITH BUCKET 3A to check altitude.
6. ORBIT 90° RIGHTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3D to check the orbit radius and altitude.
7. ORBIT 90° RIGHTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3C to check the orbit radius and altitude.
8. ORBIT 90° RIGHTWARD AROUND STAND #3.
   ALIGN WITH BUCKET 3B to check the orbit radius and altitude.

CHANGE TO THE LOWER ALTITUDE (S)

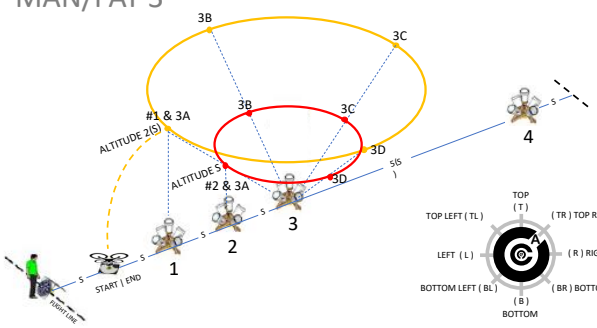
9. HOVER OVER STAND #2 AT ALTITUDE (S) TO SEE BUCKET 3A.
   ALIGN WITH BUCKET 2 to check the orbit radius.
   ALIGN WITH BUCKET 3A to check altitude.
10. ORBIT 90° LEFTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3B to check the orbit radius and altitude.
11. ORBIT 90° LEFTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3C to check the orbit radius and altitude.
12. ORBIT 90° LEFTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3D to check the orbit radius and altitude.

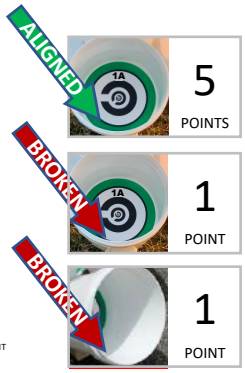
13. HOVER OVER STAND #2 AT ALTITUDE (S) TO SEE BUCKET 3A.
    ALIGN WITH BUCKET 2 to check the orbit radius.
    ALIGN WITH BUCKET 3A to check altitude.
14. ORBIT 90° RIGHTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3D to check the orbit radius and altitude.
15. ORBIT 90° RIGHTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3C to check the orbit radius and altitude.
16. ORBIT 90° RIGHTWARD AROUND STAND #3.
    ALIGN WITH BUCKET 3B to check the orbit radius and altitude.

STOP THE TIMER and capture a clock image with the drone to record the end of the trial (pre or post landing).

Open Lane: Orbit

MAN/PAY 3





Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

OPEN LANE | ORBIT TEST		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**ALIGN OVER STAND #1 AT ALTITUDE "2S"** TO CHECK RADIUS	1: 5pt 1pt 0pt	T	BL	R	BR	L
2	**ALIGN WITH BUCKET 3A** TO CHECK ALTITUDE	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
3	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
4	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
5	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
6	**ALIGN OVER STAND #1 AT ALTITUDE "2S"** TO CHECK RADIUS	1: 5pt 1pt 0pt	T	BL	R	BR	L
7	**ALIGN WITH BUCKET 3A** TO CHECK ALTITUDE	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
8	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
9	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
10	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
11	**ALIGN OVER STAND #2 AT ALTITUDE "S"** TO CHECK RADIUS	2: 5pt 1pt 0pt	BL	T	BR	R	TL
12	**ALIGN WITH BUCKET 3A** TO CHECK ALTITUDE	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
13	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
14	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
15	**ORBIT LEFTWARD 90°** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
16	**ALIGN OVER STAND #2 AT ALTITUDE "S"** TO CHECK RADIUS	2: 5pt 1pt 0pt	BL	T	BR	R	TL
17	**ALIGN WITH BUCKET 3A** TO CHECK ALTITUDE	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
18	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
19	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
20	**ORBIT RIGHTWARD 90°** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

TARGETS VERSION 2020B

MAN SCORE
TOTAL PONTS (MAX = 100)

EFFICIENCY
MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

PAY SCORE
CORRECT GAPS (MAX = 100)

EFFICIENCY
CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

ATTESTATIONS

PILOT

NAME _____

ORG _____

STATE _____ ZIP CODE _____

EMAIL _____

PHONE _____

PROCTOR OR VISUAL OBSERVER

NAME _____

ORG _____

STATE _____ PROCTOR CODE _____

EMAIL _____

Open Lane: Inspect

MAN/PAY 4

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

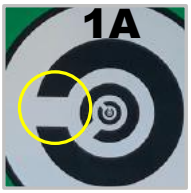
20 ALIGNMENTS TOTAL UP TO 100 POINTS

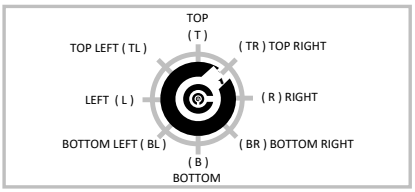
Payload Functionality (PAY)

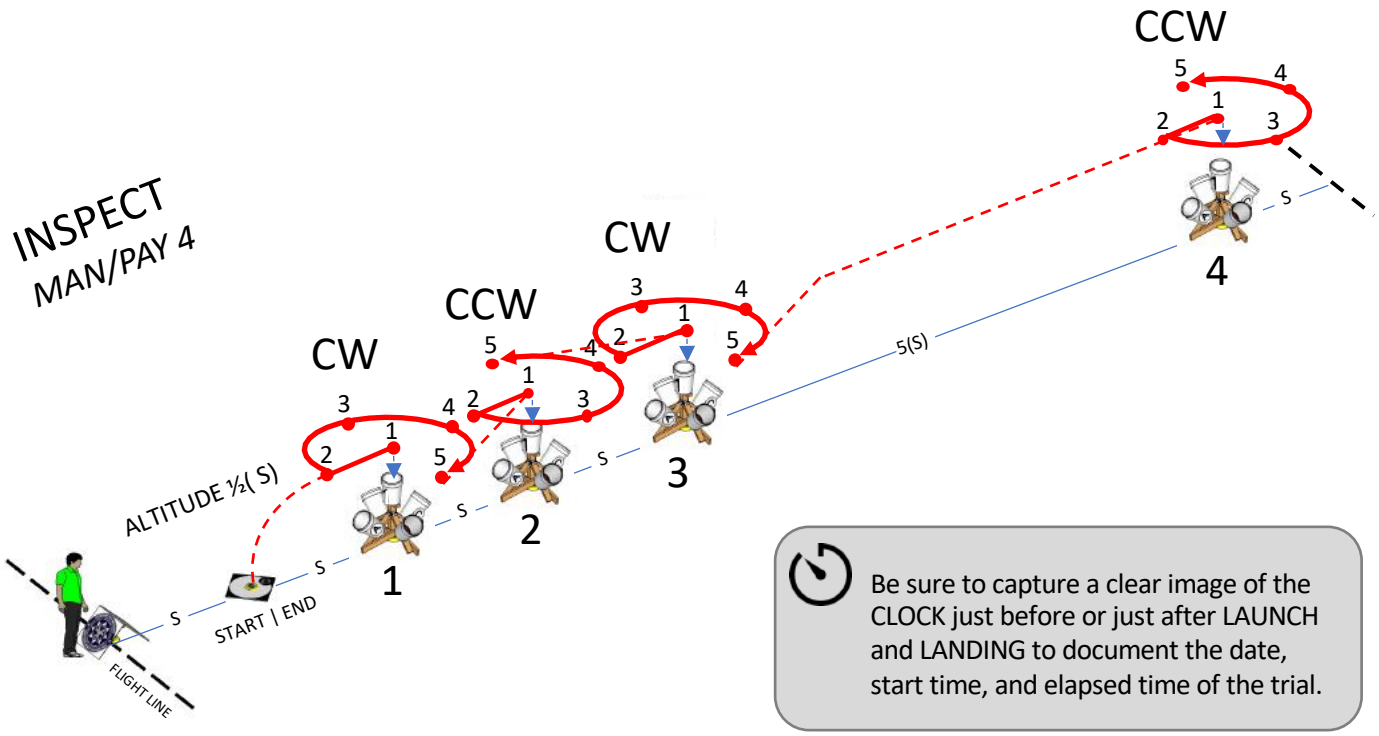
ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS







Be sure to capture a clear image of the CLOCK just before or just after LAUNCH and LANDING to document the date, start time, and elapsed time of the trial.

*If your aircraft camera has a limited range of motion, align with as many targets as possible. Pilot proficiency should only be compared using similar aircraft.

Open Lane: Inspect

MAN/PAY 4

SUMMARY

INSPECT trials evaluate drones **flying in closer proximity around objects to inspect detailed features** on the top and all sides. The drone flies at altitude 1/2(S) all around each omni bucket stand to align with the designated buckets. Inspection tasks start on top then rotate around the objects in alternating clockwise and counter clockwise directions. Accurate landings are not included. Each alignment requires capturing a single image for scoring after the trial. A complete trial includes 4 omni bucket stand with 20 designated alignments scoring up to 100 maneuvering points. Separate Payload Functionality scores totaling up to 100 acuity points are based on the number of acuity target gaps correctly identified during each alignment.

METRICS

- ***Score*** = Total alignment points accumulated during a trial (up to 100 points).
- ***Acuity*** = The average number of ring gaps correctly identified during each alignment (based on the zoom capabilities of the drone).
- ***Efficiency*** = The elapsed time of a complete trial (20 alignments) with perfect score (100 points)

SCORING

- **Altitudes**: Perform these trials at altitude 1/2(S).
- **Maneuvering Points:** Verbally announce alignment and capture a single no-zoom image of each bucket.
- **Acuity Points:** Verbally announce ring gaps and capture a single max-zoom image of each acuity target.

PROCEDURE:

START THE TIMER and capture a clock image with the drone to record the start time (pre or post launch).

STAND #1 – CLOCKWISE (1 A B C D)

1. HOVER OVER STAND #1 ALIGNED WITH **BUCKET 1**
2. PITCH BACKWARD TO ALIGN WITH **BUCKET 1A**
3. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 1B**
4. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 1C**
5. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 1D**

STAND #2 – COUNTER CLOCKWISE (2 A D C B)

6. HOVER OVER STAND #2 ALIGNED WITH **BUCKET 2**
7. PITCH BACKWARD TO ALIGN WITH **BUCKET 2A**
8. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 2D**
9. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 2C**
10. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 2B**

STAND #3 – CLOCKWISE (3 A B C D)

11. HOVER OVER STAND #3 ALIGNED WITH **BUCKET 3**
12. PITCH BACKWARD TO ALIGN WITH **BUCKET 3A**
13. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 3B**
14. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 3C**
15. ORBIT 90° LEFTWARD TO ALIGN WITH **BUCKET 3D**

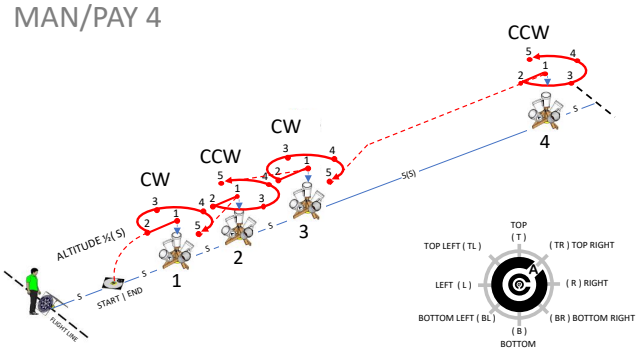
STAND #4 – COUNTER CLOCKWISE (4 A D C B)

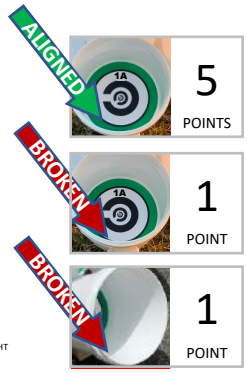
16. HOVER OVER STAND #4 ALIGNED WITH **BUCKET 4**
17. PITCH BACKWARD TO ALIGN WITH **BUCKET 4A**
18. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 4D**
19. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 4C**
20. ORBIT 90° RIGHTWARD TO ALIGN WITH **BUCKET 4B**

STOP THE TIMER and capture a clock image with the drone to record the end of the trial (pre or post landing).

Open Lane: Inspect

MAN/PAY 4





Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

OPEN LANE | INSPECT TEST		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**HOVER OVER STAND #1 AT ANY ALTITUDE** TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
2	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
3	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1B: 5pt 1pt 0pt	R	TL	T	BL	B
4	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1C: 5pt 1pt 0pt	BR	R	TL	L	BR
5	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1D: 5pt 1pt 0pt	B	TL	R	BL	T
6	**HOVER OVER STAND #2 AT ANY ALTITUDE** TO ALIGN WITH	2: 5pt 1pt 0pt	BL	T	BR	R	TL
7	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	2A: 5pt 1pt 0pt	L	BR	T	TL	R
8	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2D: 5pt 1pt 0pt	TR	B	TL	B	BL
9	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2C: 5pt 1pt 0pt	T	BL	R	TL	B
10	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2B: 5pt 1pt 0pt	TL	R	TR	L	BR
11	**HOVER OVER STAND #3 AT ANY ALTITUDE** TO ALIGN WITH	3: 5pt 1pt 0pt	R	TL	B	BL	R
12	**PITCH BACKWARD AT ANY PROXIMITY** TO ALIGN WITH	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
13	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
14	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
15	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
16	**HOVER OVER STAND #4 AT ANY ALTITUDE** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
17	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	4A: 5pt 1pt 0pt	T	BL	B	TR	L
18	**ORBIT RIGHTWARD 90° FLYING FREELYY** TO ALIGN WITH	4D: 5pt 1pt 0pt	BR	B	TL	B	TR
19	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	4C: 5pt 1pt 0pt	R	BL	T	TR	B
20	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	4B: 5pt 1pt 0pt	TR	L	BL	R	TL
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

TARGETS VERSION 2020B

MAN SCORE

TOTAL PONTS (MAX = 100)

EFFICIENCY

MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

PAY SCORE

CORRECT GAPS (MAX = 100)

EFFICIENCY

CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

ATTESTATIONS

PILOT

NAME _____

ORG _____

STATE _____ ZIP CODE _____

EMAIL _____

PHONE _____

PROCTOR OR VISUAL OBSERVER

NAME _____

ORG _____

STATE _____ PROCTOR CODE _____

EMAIL _____

Open Lane: Recon

MAN/PAY 5

Basic Maneuvering (MAN)

ALIGN WITH BUCKETS AND LAND ACCURATELY

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** showing the green ring inside the bucket. Score 5 points for a continuous green ring or 1 point for a partial green ring. Similar scoring for accurate or partial landings.

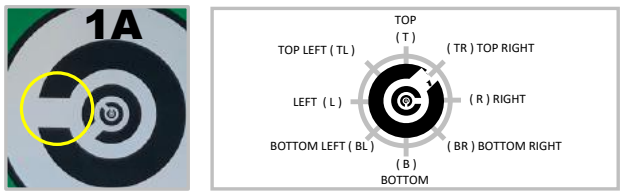
20 ALIGNMENTS TOTAL UP TO 100 POINTS

Payload Functionality (PAY)

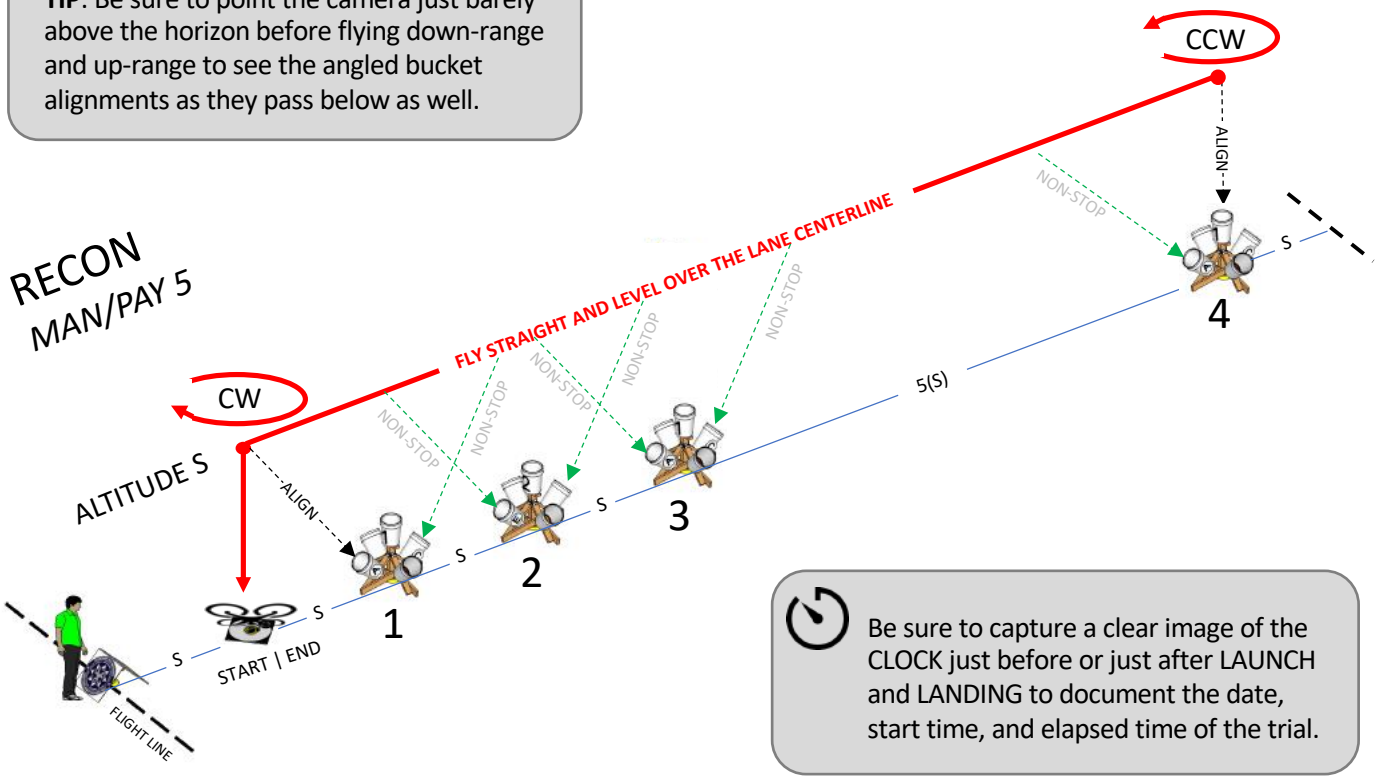
ALIGN AND IDENTIFY ACUITY TARGETS

Align with each bucket long enough to capture a **single alignment image (NO ZOOM)** of each bucket AND a **single acuity image (MAX ZOOM)** of each target. Score 1 point for each correct identification of the 5 increasingly small Concentric C gap directions.

20 TARGETS TOTAL UP TO 100 POINTS



TIP: Be sure to point the camera just barely above the horizon before flying down-range and up-range to see the angled bucket alignments as they pass below as well.



Be sure to capture a clear image of the CLOCK just before or just after LAUNCH and LANDING to document the date, start time, and elapsed time of the trial.

*If your aircraft camera has a limited range of motion, align with as many targets as possible. Pilot proficiency should only be compared using similar aircraft.

Open Lane: Recon

MAN/PAY 5

SUMMARY

Recon trials evaluate drones flying **straight and level down range to establish stable hovers over objects** in open space to perform reconnaissance tasks. The drone flies at altitude (S) at a sustainable speed directly over the lane centerline to align with designated buckets and the landing at each end of the lane. The down range reconnaissance tasks include looking straight down on the objects in different orientations and at an angle. A complete trial covers a total distance of 80(S) with moving (non-stop) alignments over the angled buckets along the centerline helping to identify deviations from the intended path and encourage consistency. During the straight and level flight path maintain a downward angled camera view seeing just above the horizon to watch the angled bucket alignments along the flight path. Accurate landings are not included. Each hovering alignment requires capturing a single image for scoring after the trial (moving alignments provide guidance but are not scored). A complete trial includes 5 laps with 20 designated alignments scoring up to 100 maneuvering points. Separate Payload Functionality scores totaling up to 100 acuity points are based on the number of acuity target gaps correctly identified during each alignment.

METRICS

- ***Score*** = Total alignment points accumulated during a trial (up to 100 points).
- ***Acuity*** = The average number of ring gaps correctly identified during each alignment (based on the zoom capabilities of the drone).
- ***Efficiency*** = The elapsed time of a complete trial (20 alignments) with perfect score (100 points)

SCORING

- ***Altitudes****: Perform these trials at altitude 1/2(S).*
- ***Maneuvering Points****: Verbally announce alignment and capture a single no-zoom image of each bucket.*
- ***Acuity Points****: Verbally announce ring gaps and capture a single max-zoom image of each acuity target.*

PROCEDURE:

START THE TIMER and capture a clock image with the drone to record the start time (pre or post launch).

1. HOVER OVER THE LAUNCH (L) AT ALTITUDE (S) TO SEE BUCKET 1A. FLY STRAIGHT AND LEVEL DOWN RANGE DIRECTLY OVER THE LANE CENTERLINE. HOVER OVER STAND #4.
   – ALIGN WITH BUCKET 4 to check position.

2. YAW LEFT 180°.
   – ALIGN WITH BUCKET 4 (UPSIDE DOWN) to check position.

3. FLY STRAIGHT AND LEVEL UP RANGE DIRECTLY OVER THE LANE CENTERLINE. HOVER OVER THE LANDING.
   – ALIGN WITH THE LANDING (L) to check position.

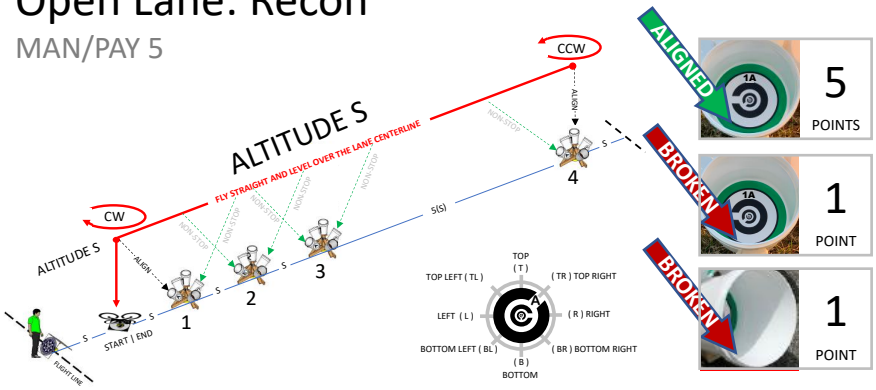
4. YAW RIGHT 180°.
   – ALIGN WITH BUCKET 1A to check altitude.

REPEAT 1–4 to complete 5 laps total with 20 alignments.

STOP THE TIMER and capture a clock image with the drone to record the end of the trial (pre or post landing).

Open Lane: Recon

MAN/PAY 5



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING S	LIGHTING	WIND	PILOT VIEW	TIME LIMIT
10 FT 20 FT 30 FT _____ FT (CIRCLE ONE OR FILL IN)	DAYLIGHT 1000+ LUX LIGHTED 300+ LUX DARK < 1 LUX (CIRCLE ONE)	AVERAGE _____ MPH GUSTS _____ MPH	LINE OF SIGHT FACING LANE OPTIONAL V.O. INTERFACE ONLY BACK TO LANE MANDATORY V.O. (CIRCLE ONE)	5 MIN 10 MIN _____ MIN (CIRCLE ONE OR FILL IN)

OPEN LANE | RECON TEST		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**FLY STRAIGHT AND LEVEL OVER STAND #4** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
2	**YAW LEFTWARD 180°** TO ALIGN WITH	4: 5pt 1pt 0pt	BR	T	BL	L	TL
3	**FLY OVER THE LANDING THEN YAW RIGHT 180°** TO ALIGN WI	L: 5pt 1pt 0pt	B	TR	L	BL	T
4	**HOVER IN PLACE** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
5	**FLY STRAIGHT AND LEVEL OVER STAND #4** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
6	**YAW LEFTWARD 180°** TO ALIGN WITH	4: 5pt 1pt 0pt	BR	T	BL	L	TL
7	**FLY OVER THE LANDING THEN YAW RIGHT 180°** TO ALIGN WI	L: 5pt 1pt 0pt	B	TR	L	BL	T
8	**HOVER IN PLACE** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
9	**FLY STRAIGHT AND LEVEL OVER STAND #4** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
10	**YAW LEFTWARD 180°** TO ALIGN WITH	4: 5pt 1pt 0pt	BR	T	BL	L	TL
11	**FLY STRAIGHT AND LEVEL OVER THE LANDING** TO ALIGN WITH	L: 5pt 1pt 0pt	B	TR	L	BL	T
12	**YAW RIGHTWARD 180°** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
13	**FLY STRAIGHT AND LEVEL OVER STAND #4** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
14	**YAW LEFTWARD 180°** TO ALIGN WITH	4: 5pt 1pt 0pt	BR	T	BL	L	TL
15	**FLY OVER THE LANDING THEN YAW RIGHT 180°** TO ALIGN WI	L: 5pt 1pt 0pt	B	TR	L	BL	T
16	**HOVER IN PLACE** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
17	**FLY STRAIGHT AND LEVEL OVER STAND #4** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
18	**YAW LEFTWARD 180°** TO ALIGN WITH	4: 5pt 1pt 0pt	BR	T	BL	L	TL
19	**FLY OVER THE LANDING THEN YAW RIGHT 180°** TO ALIGN WI	L: 5pt 1pt 0pt	B	TR	L	BL	T
20	**HOVER IN PLACE** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

UNDERLINE MEANS READING UPSIDE DOWN

TARGETS VERSION 2020B

MAN SCORE

TOTAL PONTS (MAX = 100)

EFFICIENCY

MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

PAY SCORE

CORRECT GAPS (MAX = 100)

EFFICIENCY

CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

ATTESTATIONS

PILOT

NAME _____

ORG _____

STATE _____ ZIP CODE _____

EMAIL _____

PHONE _____

PROCTOR OR VISUAL OBSERVER

NAME _____

ORG _____

STATE _____ PROCTOR CODE _____

EMAIL _____

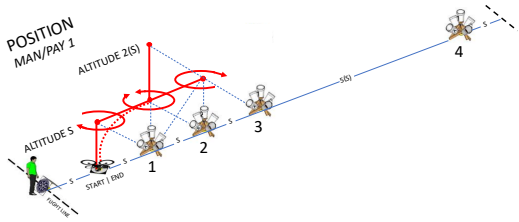
Open Test Lane and Related Scenarios

CHECKRIDE SCORESHEET

The aircraft performs a series of maneuvering paths around the omni bucket stands in the test lane or as embedded scoring tasks in the related scenarios. Each flight path includes alignments with one or more buckets to identify recessed targets inside. Successful alignment is achieved when the drone can maintain the designated position, orientation, and altitude long enough to verify an unobstructed view of the inscribed ring at the bottom of the bucket. A single alignment image is captured of each bucket to use for scoring after the trial. Additional targets inside each bucket evaluate camera pointing, zooming, and exposure control to measure visual and thermal acuity and identify color shifts, hazardous material labels, or other objects of interest. Faults for extreme deviations from the intended flight paths or contact with any of the test apparatuses ends the trial to ensure safety.

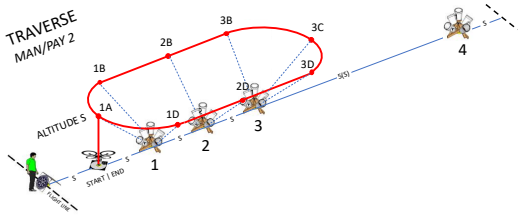
POSTION (MAN/PAY 1)

Evaluate basic flight maneuvers between designated hover positions, orientations, and altitudes along the lane centerline to demonstrate positive aircraft control at all times. The drone performs a series of maneuvers including climb, descend, yaw, pitch, and roll to simultaneously align with two buckets in each position, orientation, and altitude. The aircraft then lands centered on the platform with the chassis or any ground contact within a 30 cm (12 in) radius circle.



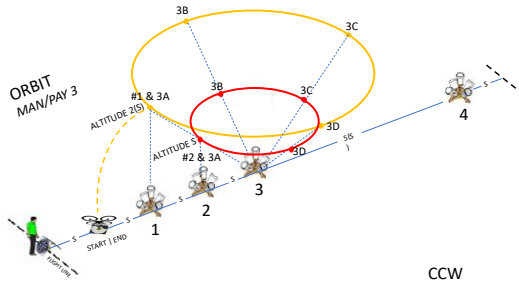
TRAVERSE (MAN/PAY 2)

Evaluate drones flying sideways parallel to objects while looking forward to identify features as if along a building, woods line, truck/bus, etc. The drone flies at altitude (S) to complete two laps in both directions around the omni bucket stands to align with the designated buckets. The drone also lands centered on the platform with the chassis or any ground contact within a 30 cm (12 in) radius circle.



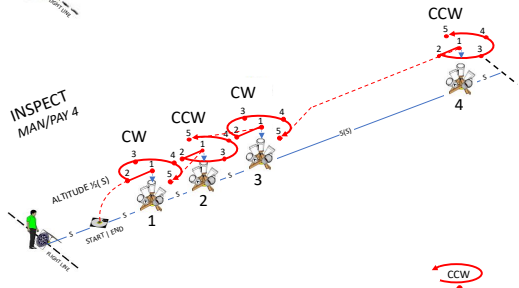
ORBIT (MAN/PAY 3)

Evaluate drones flying circular flight paths at different altitudes around objects while looking inward to identify features on all four sides. The drone orbits at altitude 2(S) in both directions then altitude (S) in both directions to align with the designated buckets. Each orbit starts with an initial downward bucket alignment to check the radius before proceeding leftward and rightward. Accurate landings are not included.



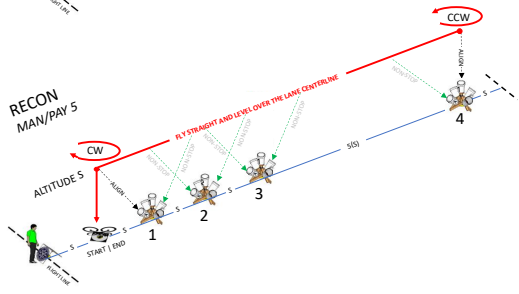
INSPECT (MAN/PAY 4)

Evaluate drones flying in closer proximity around objects to inspect detailed features on the top and all sides. The drone flies at altitude 1/2(S) all around each omni bucket stand to align with the designated buckets. Inspection tasks start on top then rotate around the objects in alternating clockwise and counter clockwise directions. Accurate landings are not included.



RECON (MAN/PAY 5)

Evaluate drones flying straight and level down range to establish stable hovers over objects in open space to perform reconnaissance tasks. The drone flies at altitude (S) at a sustainable speed directly over the lane centerline to align with designated buckets and the landing at each end of the lane. The down range reconnaissance tasks include looking straight down on the objects in different orientations and at an angle. A complete trial covers a total distance of 80(S) with moving (non-stop) alignments over the angled buckets along the centerline helping to identify deviations from the intended path and encourage consistency.



NIST National Institute of Standards and Technology U.S. Department of Commerce

Standard Test Methods for Small Unmanned Aircraft Systems

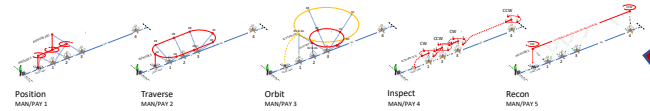
ASTM International Standards Committee on Homeland Security Applications; Response Robots (E54.09) | Website: RobotTestMethods.nist.gov

ASTM INTERNATIONAL

Version: 2020B2

Open Test Lane and Scenarios

CHECKRIDE SCORESHEET



4 Omni Stands (20 Buckets)
TOTAL 100 pts

4 Omni Stands (20 Buckets)
TOTAL 100 pts

1 Omni Stand + 16 Exterior Targets
TOTAL 100 pts

Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LANE SPACING (S)

10 FT 20 FT 30 FT

_____ FT

(CIRCLE ONE OR FILL IN)

LIGHTING

DAYLIGHT 1000+ LUX | LIGHTED 300+ LUX | DARK < 1 LUX

(CIRCLE ONE)

WIND

AVERAGE _____ MPH | GUSTS _____ MPH

PILOT VIEW

LINE OF SIGHT FACING LANE OPTIONAL V.O. | INTERFACE ONLY BACK TO LANE MANDATORY V.O.

(CIRCLE ONE)

TIME LIMIT

10 MIN | 20 MIN | _____ MIN

(CIRCLE ONE OR FILL IN)

MANUEVERING SCORE: Circle the bucket number for full alignments (5 pts), or write a "1" over the bucket number for partial alignments (1 pt), or "X" through the bucket number for missed buckets (0 pts). **PAYLOAD SCOR**E: Circle correctly identified gap orientations using the answer key (1 pt each).

Answer key is relative to top of image when in the correct position.

Key: 2020B	OPEN TEST LANE					SCENARIOS	
	1 Position	2 Traverse	3 Orbit	4 Inspect	5 Recon	Search	Vehicle ____
1	1 T BL R BR L HOVER	1A TR B TR L BR LEFTWARD	1 T BL R BR L LEFTWARD	1 T BL R BR L	4 TL B TR R BR	1 T BL R BR L	A1 T BL R BR L
2	2A L BR T TL R	1B R TL T BL B	3A BR T TL R BL	1A TR B TR L BR	7 BR T BL L TL upside down	1A TR B TR L BR	A2 TR B TR L BR
3	1 T BL R BR L YAW LEFT	2B TL R TR L BR	3B B TR R BL T	1B R TL T BL B	L B TR L BL T	1B R TL T BL B	A3 R TL T BL B
4	2A L BR T TL R	3B B TR R BL T	3C BL R BL T BR	1C BR R TL L BR	1A TR B TR L BR	1C BR R TL L BR	A4 BR R TL L BR
5	1 T BL R BR L YAW RIGHT	3C BL R BL T BR	3D L TL R BR T	1D B TL R BL T	4 TL B TR R BR NEXT LAP	1D B TL R BL T	A5 B TL R BL T
6	2A L BR T TL R	3D L TL R BR T	1 T BL R BR L RIGHTWARD	2 BL T BR R TL NEXT STAND	7 BR T BL L TL upside down	2 BL T BR R TL	B1 BL T BR R TL
7	1 T BL R BR L CLIMB	2D TR B TL B BL	3A BR T TL R BL	2A L BR T TL R	L B TR L BL T	2A L BR T TL R	B2 L BR T TL R
8	3A BR T TL R BL	1D B TL R BL T	3D L TL R BR T	2D TR B TL B BL	1A TR B TR L BR	2D TR B TL B BL	B3 TL R TR L BR
9	1 T BL R BR L DESCEND	1A TR B TR L BR	3C BL R BL T BR	2C T BL R TL B	4 TL B TR R BR NEXT LAP	2C T BL R TL B	B4 T BL R TL B
10	2A L BR T TL R	L B TR L BL T	3B B TR R BL T	2B TL R TR L BR	7 BR T BL L TL upside down	2B TL R TR L BR	B5 TR B TL B BL
11	2 BL T BR R TL FORWARD	1A TR B TR L BR RIGHTWARD	2 BL T BR R TL LEFTWARD	3 R TL B BL R NEXT STAND	L B TR L BL T	3 R TL B BL R	C1 R TL B BL R
12	3A BL T BR R TL	1D B TL R BL T	3A BR T TL R BL	3A BR T TL R BL	1A TR B TR L BR	3A BR T TL R BL	C2 BR T TL R BL
13	1 T BL R BR L BACKWARD	2D TR B TL B BL	3B B TR R BL T	3B B TR R BL T	4 TL B TR R BR NEXT LAP	3B B TR R BL T	C3 B TR R BL T
14	2A L BR T TL R	3D L TL R BR T	3C BL R BL T BR	3C BL R BL T BR	7 BR T BL L TL upside down	3C BL R BL T BR	C4 BL R BL T BR
15	2 TR B TL L BR FWD & YAW LEFT upside down	3C BL R BL T BR	3D L TL R BR T	3D L TL R BR T	L B TR L BL T	3D L TL R BR T	C5 L TL R BR T
16	1C BR R TL L BR	3B B TR R BL T	2 BL T BR R TL RIGHTWARD	4 TL B TR R BR NEXT STAND	1A TR B TR L BR	4 TL B TR R BR	D1 TL B TR R BR
17	L B TR L BL T FWD & YAW RIGHT	2B TL R TR L BR	3A BR T TL R BL	4A T BL B TR L	4 TL B TR R BR NEXT LAP	4A T BL B TR L	D2 T BL B TR L
18	1A TR B TR L BR	1B R TL T BL B	3D L TL R BR T	4D BR B TL B TR	7 BR T BL L TL upside down	4D BR B TL B TR	D3 TR L BL R TL
19	P1 BL R TL L BL LAND	1A TR B TR L BR	3C BL R BL T BR	4C R BL T TR B	L B TR L BL T	4C R BL T TR B	D4 R BL T TR B
20	P2 L BR T TL B	L B TR L BL T	3B B TR R BL T	4B TR L BL R TL	1A TR B TR L BR	4B TR L BL R TL	D5 BR B TL B TR
TOTAL	MAN /100	MAN /100	MAN /100	MAN /100	MAN /100	MAN /100	MAN /100
	PAY /100	PAY /100	PAY /100	PAY /100	PAY /100	PAY /100	PAY /100
Elapsed Time	: :	: :	: :	: :	: :	: :	: :
	PASS FAIL	PASS FAIL	PASS FAIL	PASS FAIL	PASS FAIL	PASS FAIL	PASS FAIL

*If your training aircraft camera has a limited range of motion, align with as many buckets as possible. Pilot proficiency is only compared using similar systems.

Wide Area Search

OPEN SCENARIO

All Basic Lane Buckets
https://drive.google.com/open?id=1NOrHY3UH98fUeXKyffnQwt6-h5ewoeqU

Letters - INSERT DISCS FOR MAN
https://drive.google.com/open?id=1FoQvoKkQu5iUC4bJJNM7TailCWWs-C3_

Concentric Cs Black - SENSOR PANELS
https://drive.google.com/open?id=1YxY1_26dn1KB0FHfleU4Xna_gxHzw98L

Concentric Cs Color - SCENARIOS
https://drive.google.com/open?id=198sR8TzRB4TKtvZvHcAuXRWdgS35Thzj

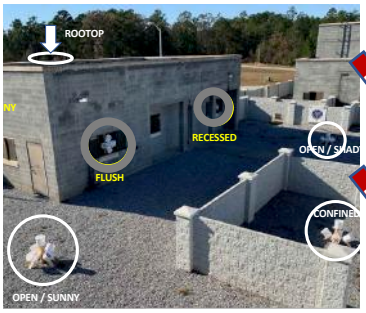
Misc Hazmats, Directions, Plates, Images
https://drive.google.com/open?id=1nuHyZS9ARZ6KkF_vJZKbhO6gwEo4UlkM

Xtra Bucket Stands for Scenarios
https://drive.google.com/open?id=1RklQazk4r8ZyUPJxidjlNpVyF-ZNRCrn

*If your training aircraft camera has a limited range of motion, align with as many buckets as possible.
Pilot proficiency should only be compared using similar systems.

Wide Area Search

OPEN SCENARIO



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LOCATION	LIGHTING			WIND		PILOT VIEW		TIME LIMIT		
	DAYLIGHT 1000+ LUX	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACING LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	10 MIN	20 MIN	____ MIN
(CIRCLE ONE OR FILL IN)	(CIRCLE ONE)			____ MPH	____ MPH	(CIRCLE ONE)		(CIRCLE ONE OR FILL IN)		

OPEN SCENARIO | WIDE AREA SEARCH		MANEUVERING (MAN)	PAYLOAD FUNCTIONALITY (PAY)				
START TIMER *(CAPTURE CLOCK IMAGE)* : :		CIRCLE POINTS SCORED IN EACH ALIGNMENT IMAGE	CIRCLE GAPS CORRECTLY IDENTIFIED BY THE PILOT DURING THE TRIAL				
1	**HOVER OVER STAND #1 AT ANY ALTITUDE** TO ALIGN WITH	1: 5pt 1pt 0pt	T	BL	R	BR	L
2	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	1A: 5pt 1pt 0pt	TR	B	TR	L	BR
3	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1B: 5pt 1pt 0pt	R	TL	T	BL	B
4	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1C: 5pt 1pt 0pt	BR	R	TL	L	BR
5	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	1D: 5pt 1pt 0pt	B	TL	R	BL	T
6	**HOVER OVER STAND #2 AT ANY ALTITUDE** TO ALIGN WITH	2: 5pt 1pt 0pt	BL	T	BR	R	TL
7	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	2A: 5pt 1pt 0pt	L	BR	T	TL	R
8	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2D: 5pt 1pt 0pt	TR	B	TL	B	BL
9	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2C: 5pt 1pt 0pt	T	BL	R	TL	B
10	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	2B: 5pt 1pt 0pt	TL	R	TR	L	BR
11	**HOVER OVER STAND #3 AT ANY ALTITUDE** TO ALIGN WITH	3: 5pt 1pt 0pt	R	TL	B	BL	R
12	**PITCH BACKWARD AT ANY PROXIMITY** TO ALIGN WITH	3A: 5pt 1pt 0pt	BR	T	TL	R	BL
13	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3B: 5pt 1pt 0pt	B	TR	R	BL	T
14	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3C: 5pt 1pt 0pt	BL	R	BL	T	BR
15	**ORBIT LEFTWARD 90° FLYING FREELY** TO ALIGN WITH	3D: 5pt 1pt 0pt	L	TL	R	BR	T
16	**HOVER OVER STAND #4 AT ANY ALTITUDE** TO ALIGN WITH	4: 5pt 1pt 0pt	TL	B	TR	R	BR
17	**PITCH BACKWARD FLYING FREELY** TO ALIGN WITH	4A: 5pt 1pt 0pt	T	BL	B	TR	L
18	**ORBIT RIGHTWARD 90° FLYING FREELYY** TO ALIGN WITH	4D: 5pt 1pt 0pt	BR	B	TL	B	TR
19	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	4C: 5pt 1pt 0pt	R	BL	T	TR	B
20	**ORBIT RIGHTWARD 90° FLYING FREELY** TO ALIGN WITH	4B: 5pt 1pt 0pt	TR	L	BL	R	TL
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME: MIN SEC					

TARGETS VERSION 2020B

MAN SCORE

TOTAL PONTS (MAX = 100)

EFFICIENCY

MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE

SAFETY SCORE TIME

PAY SCORE

CORRECT GAPS (MAX = 100)

EFFICIENCY

CORRECT GAPS / MINUTES (DECIMAL)

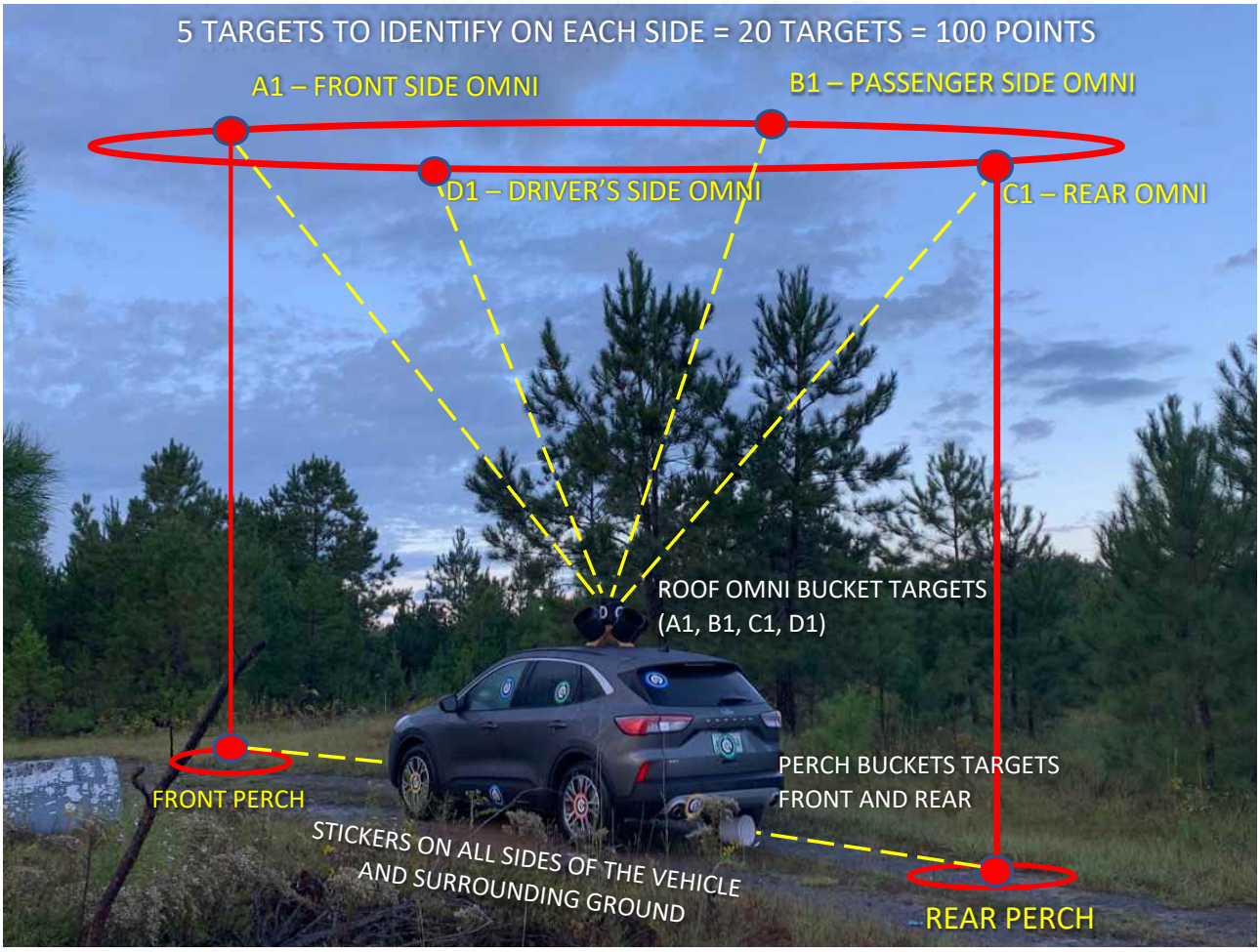
PASS (>____)

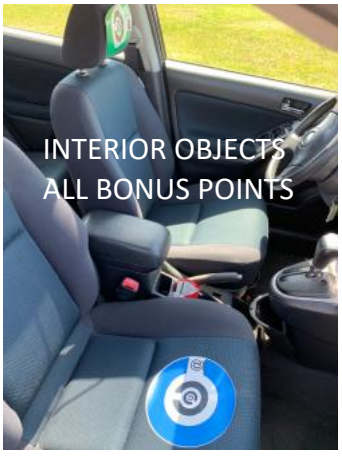
OR CIRCLE FAILURE

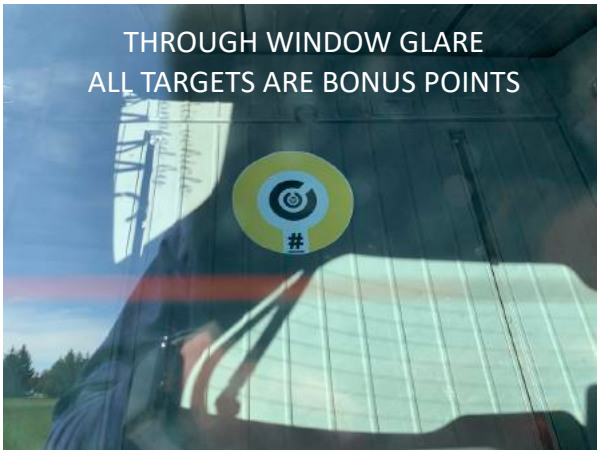
SAFETY SCORE TIME

Vehicle Identification

OPEN SCENARIO



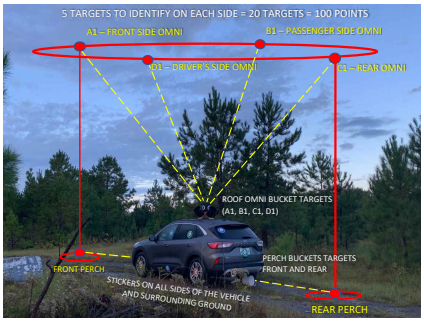




*If your training aircraft camera has a limited range of motion, align with as many buckets as possible.
Pilot proficiency should only be compared using similar systems.

Vehicle Identification

OPEN SCENARIO



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LOCATION	LIGHTING			WIND		PILOT VIEW		TIME LIMIT		
	DAYLIGHT 1000+ LUX	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACING LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	10 MIN	20 MIN	____ MIN
(CIRCLE ONE OR FILL IN)	(CIRCLE ONE)			____ MPH	____ MPH	(CIRCLE ONE)		(CIRCLE ONE OR FILL IN)		

NOTE: ALL SOCRING IS FROM THE DESIGNATED ORBIT ALTITUDE EXCEPT FOR THE PERCH LOCATIONS ON THE FRONT (A) AND REAR (C) SIDES FOR ALIGNMENT AND ACUITY

OPEN SCENARIO VERSION 2020B

START TIMER *(CAPTURE CLOCK IMAGE)* : :		FULLY ALIGNED IMAGE = 5 PARTIALLY ALIGNED IMAGE = 1			CIRCLE GAPS CORRECTLY IDENTIFIED VERBALLY BY THE PILOT DURING THE TRIAL = 1 POINT EACH				
0	ROOF OMNI STAND – INSIDE TOP BUCKET NUMBER Identify Acuity or Disk Insert to Determine if Inspection is Needed	TOP BUCKET #: _____							
1	A1 – FRONT SIDE – ROOFTOP OMNI BUCKET	5 pt	1 pt	0 pt	T	BL	R	BR	L
2	A2 – FRONT SIDE – WINDSHIELD CENTER FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	TR	B	TR	L	BR
3	A3 – FRONT SIDE – VIN #	5 pt	1 pt	0 pt	R	TL	T	BL	B
4	A4 – FRONT SIDE – LICENSE PLATE	5 pt	1 pt	0 pt	BR	R	TL	L	BR
5	A5 – FRONT SIDE – PERCH POSITION UNDERBODY BUCKET	5 pt	1 pt	0 pt	B	TL	R	BL	T
6	B1 – PASSENGER SIDE – ROOFTOP OMNI BUCKET	5 pt	1 pt	0 pt	BL	T	BR	R	TL
7	B2 – PASSENGER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	L	BR	T	TL	R
8	B3 – PASSENGER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	TL	R	TR	L	BR
9	B4 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	5 pt	1 pt	0 pt	T	BL	R	TL	B
10	B5 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	5 pt	1 pt	0 pt	TR	B	TL	B	BL
11	C1 – REAR SIDE – ROOFTOP OMNI BUCKET	5 pt	1 pt	0 pt	R	TL	B	BL	R
12	C2 – REAR SIDE – WINDOW CENTER FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	BR	T	TL	R	BL
13	C3 – REAR SIDE – LICENSE PLATE	5 pt	1 pt	0 pt	B	TR	R	BL	T
14	C4 – REAR SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	5 pt	1 pt	0 pt	BL	R	BL	T	BR
15	C5 – REAR SIDE – PERCH POSITION UNDERBODY BUCKET	5 pt	1 pt	0 pt	L	TL	R	BR	T
16	D1 – DRIVER SIDE – ROOFTOP OMNI BUCKET	5 pt	1 pt	0 pt	TL	B	TR	R	BR
17	D2 – DRIVER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	T	BL	B	TR	L
18	D3 – DRIVER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	5 pt	1 pt	0 pt	TR	L	BL	R	TL
19	D4 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	5 pt	1 pt	0 pt	R	BL	T	TR	B
20	D5 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	5 pt	1 pt	0 pt	BR	B	TL	B	TR
STOP TIMER *(CAPTURE CLOCK IMAGE)* : :		ELAPSED TRIAL TIME:		MIN	SEC				

MAN SCORE
TOTAL PONTS (MAX = 100)

EFFICIENCY
MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

PAY SCORE
CORRECT GAPS (MAX = 100)

EFFICIENCY
CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

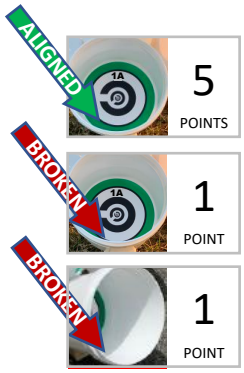
Vehicle Identification

OPEN SCENARIO

*If your training aircraft camera has a limited range of motion, align with as many buckets as possible.
Pilot proficiency should only be compared using similar systems.

Vehicle Identification

OPEN SCENARIO



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LOCATION	LIGHTING			WIND		PILOT VIEW		TIME LIMIT		
	DAYLIGHT 1000+ LUX	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACING LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	10 MIN	20 MIN	____ MIN
(CIRCLE ONE OR FILL IN)	(CIRCLE ONE)			____ MPH	____ MPH	(CIRCLE ONE)		(CIRCLE ONE OR FILL IN)		

OPEN SCENARIO | VEHICLE IDENTIFICATION

ALL SCORING IS FROM THE DESIGNATED ORBIT ALTITUDE EXCEPT FOR THE PERCH TARGETS ON THE FRONT (A) AND REAR (C) SIDE

START TIMER *(CAPTURE CLOCK IMAGE)* : :

FULLY ALIGNED IMAGE = 5
PARTIALLY ALIGNED IMAGE = 1

CIRCLE GAPS CORRECTLY IDENTIFIED VERBALLY BY THE PILOT DURING THE TRIAL = 1 POINT EACH

0	ROOF OMNI STAND – INSIDE TOP BUCKET NUMBER Identify Acuity or Disk Insert to Determine if Inspection is Needed	#	TOP BUCKET #: _____						
1	A1 – FRONT SIDE – ROOFTOP OMNI BUCKET	A1	5 pt	1 pt	0 pt	T	BL	R	BR	L
2	A2 – FRONT SIDE – WINDSHIELD CENTER FOR INTERIOR OBJECTS	A2	5 pt	1 pt	0 pt	TR	B	TR	L	BR
3	A3 – FRONT SIDE – VIN #	A3	5 pt	1 pt	0 pt	R	TL	T	BL	B
4	A4 – FRONT SIDE – LICENSE PLATE	A4	5 pt	1 pt	0 pt	BR	R	TL	L	BR
5	A5 – FRONT SIDE – PERCH POSITION UNDERBODY BUCKET	A5	5 pt	1 pt	0 pt	B	TL	R	BL	T
6	B1 – PASSENGER SIDE – ROOFTOP OMNI BUCKET	B1	5 pt	1 pt	0 pt	BL	T	BR	R	TL
7	B2 – PASSENGER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	B2	5 pt	1 pt	0 pt	L	BR	T	TL	R
8	B3 – PASSENGER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	B3	5 pt	1 pt	0 pt	TL	R	TR	L	BR
9	B4 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B4	5 pt	1 pt	0 pt	T	BL	R	TL	B
10	B5 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B5	5 pt	1 pt	0 pt	TR	B	TL	B	BL
11	C1 – REAR SIDE – ROOFTOP OMNI BUCKET	C1	5 pt	1 pt	0 pt	R	TL	B	BL	R
12	C2 – REAR SIDE – WINDOW CENTER FOR INTERIOR OBJECTS	C2	5 pt	1 pt	0 pt	BR	T	TL	R	BL
13	C3 – REAR SIDE – LICENSE PLATE	C3	5 pt	1 pt	0 pt	B	TR	R	BL	T
14	C4 – REAR SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	C4	5 pt	1 pt	0 pt	BL	R	BL	T	BR
15	C5 – REAR SIDE – PERCH POSITION UNDERBODY BUCKET	C5	5 pt	1 pt	0 pt	L	TL	R	BR	T
16	D1 – DRIVER SIDE – ROOFTOP OMNI BUCKET	D1	5 pt	1 pt	0 pt	TL	B	TR	R	BR
17	D2 – DRIVER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	D2	5 pt	1 pt	0 pt	T	BL	B	TR	L
18	D3 – DRIVER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	D3	5 pt	1 pt	0 pt	TR	L	BL	R	TL
19	D4 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D4	5 pt	1 pt	0 pt	R	BL	T	TR	B
20	D5 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D5	5 pt	1 pt	0 pt	BR	B	TL	B	TR

STOP TIMER *(CAPTURE CLOCK IMAGE)* : :

ELAPSED TRIAL TIME: MIN SEC

TARGETS VERSION 2020B

MAN SCORE
TOTAL PONTS (MAX = 100)

EFFICIENCY
MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

PAY SCORE
CORRECT GAPS (MAX = 100)

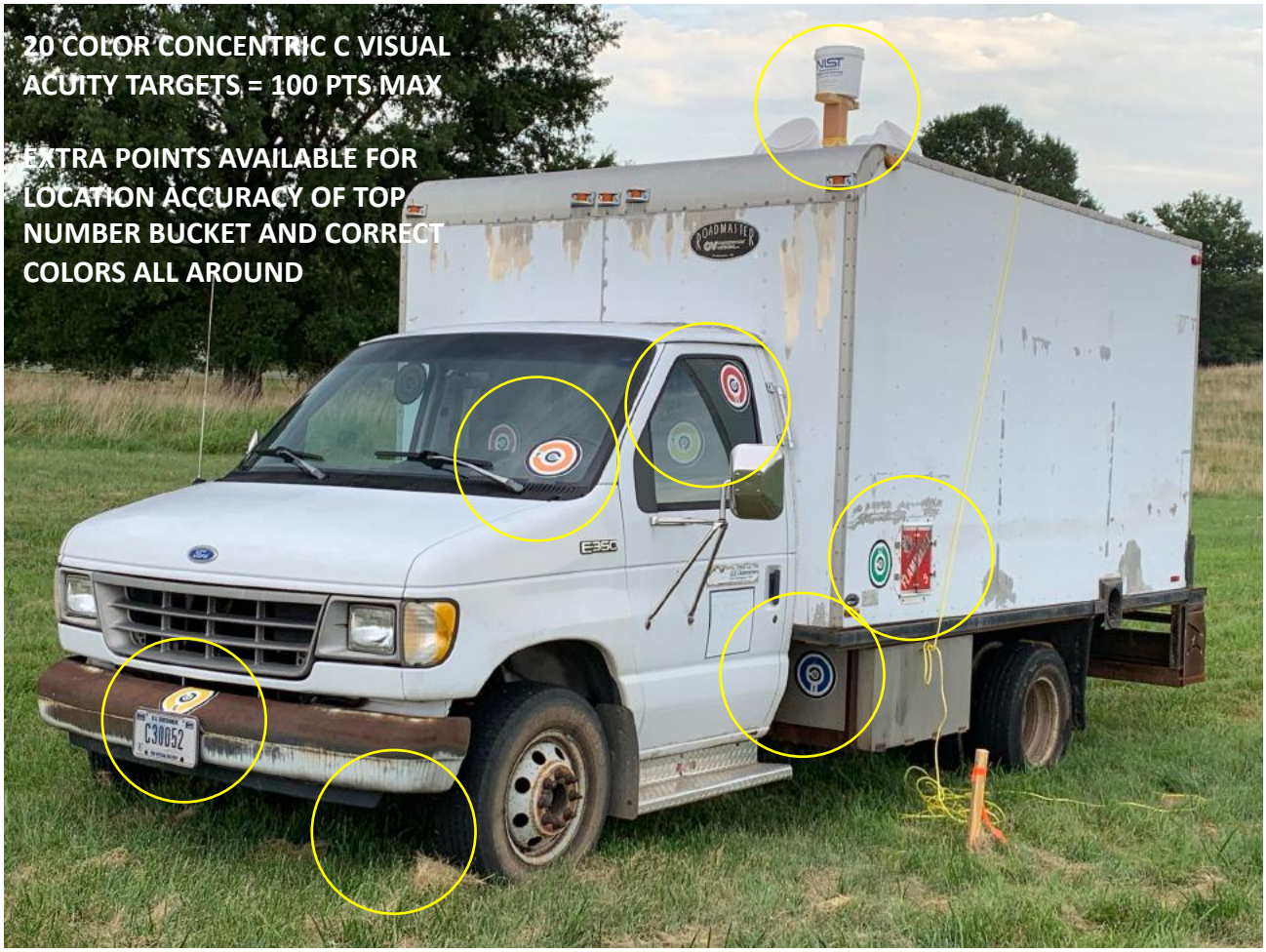
EFFICIENCY
CORRECT GAPS / MINUTES (DECIMAL)

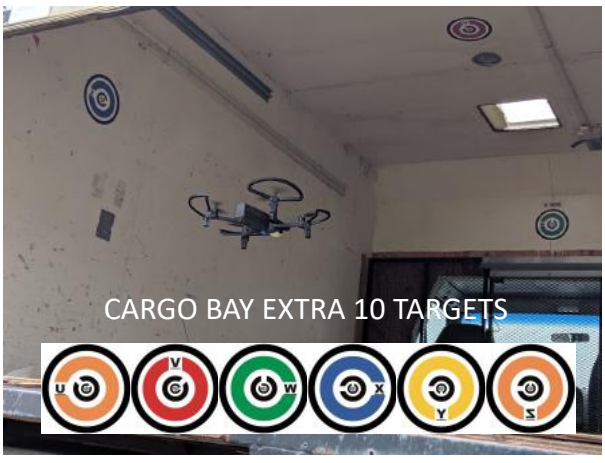
PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

Box Truck Identification

OPEN SCENARIO





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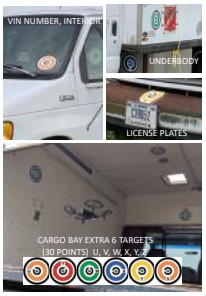
Pilot proficiency should only be compared using similar systems.

Box Truck Identification

OPEN SCENARIO



Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LOCATION	LIGHTING			WIND		PILOT VIEW		TIME LIMIT		
	DAYLIGHT 1000+ LUX	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACING LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	10 MIN	20 MIN	____ MIN
(CIRCLE ONE OR FILL IN)	(CIRCLE ONE)			____ MPH	____ MPH	(CIRCLE ONE)		(CIRCLE ONE OR FILL IN)		

OPEN SCENARIO | VEHICLE IDENTIFICATION

ALL SCORING IS FROM THE DESIGNATED ORBIT ALTITUDE EXCEPT FOR THE PERCH TARGETS ON THE FRONT (A) AND REAR (C) SIDE

START TIMER *(CAPTURE CLOCK IMAGE)* : :

FULLY ALIGNED IMAGE = 5
PARTIALLY ALIGNED IMAGE = 1

CIRCLE GAPS CORRECTLY IDENTIFIED VERBALLY BY THE PILOT DURING THE TRIAL = 1 POINT EACH

0	ROOF OMNI STAND – INSIDE TOP BUCKET NUMBER Identify Acuity or Disk Insert to Determine if Inspection is Needed	#	TOP BUCKET #: _____						
1	A1 – FRONT SIDE – ROOFTOP OMNI BUCKET	A1	5 pt	1 pt	0 pt	T	BL	R	BR	L
2	A2 – FRONT SIDE – WINDSHIELD CENTER FOR INTERIOR OBJECTS	A2	5 pt	1 pt	0 pt	TR	B	TR	L	BR
3	A3 – FRONT SIDE – VIN #	A3	5 pt	1 pt	0 pt	R	TL	T	BL	B
4	A4 – FRONT SIDE – LICENSE PLATE	A4	5 pt	1 pt	0 pt	BR	R	TL	L	BR
5	A5 – FRONT SIDE – PERCH POSITION UNDERBODY BUCKET	A5	5 pt	1 pt	0 pt	B	TL	R	BL	T
6	B1 – PASSENGER SIDE – ROOFTOP OMNI BUCKET	B1	5 pt	1 pt	0 pt	BL	T	BR	R	TL
7	B2 – PASSENGER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	B2	5 pt	1 pt	0 pt	L	BR	T	TL	R
8	B3 – PASSENGER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	B3	5 pt	1 pt	0 pt	TL	R	TR	L	BR
9	B4 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B4	5 pt	1 pt	0 pt	T	BL	R	TL	B
10	B5 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B5	5 pt	1 pt	0 pt	TR	B	TL	B	BL
11	C1 – REAR SIDE – ROOFTOP OMNI BUCKET	C1	5 pt	1 pt	0 pt	R	TL	B	BL	R
12	C2 – REAR SIDE – WINDOW CENTER FOR INTERIOR OBJECTS	C2	5 pt	1 pt	0 pt	BR	T	TL	R	BL
13	C3 – REAR SIDE – LICENSE PLATE	C3	5 pt	1 pt	0 pt	B	TR	R	BL	T
14	C4 – REAR SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	C4	5 pt	1 pt	0 pt	BL	R	BL	T	BR
15	C5 – REAR SIDE – PERCH POSITION UNDERBODY BUCKET	C5	5 pt	1 pt	0 pt	L	TL	R	BR	T
16	D1 – DRIVER SIDE – ROOFTOP OMNI BUCKET	D1	5 pt	1 pt	0 pt	TL	B	TR	R	BR
17	D2 – DRIVER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	D2	5 pt	1 pt	0 pt	T	BL	B	TR	L
18	D3 – DRIVER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	D3	5 pt	1 pt	0 pt	TR	L	BL	R	TL
19	D4 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D4	5 pt	1 pt	0 pt	R	BL	T	TR	B
20	D5 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D5	5 pt	1 pt	0 pt	BR	B	TL	B	TR

STOP TIMER *(CAPTURE CLOCK IMAGE)* : :

ELAPSED TRIAL TIME: MIN SEC

TARGETS VERSION 2020B

MAN SCORE
TOTAL PONTS (MAX = 100)

EFFICIENCY
MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

PAY SCORE
CORRECT GAPS (MAX = 100)

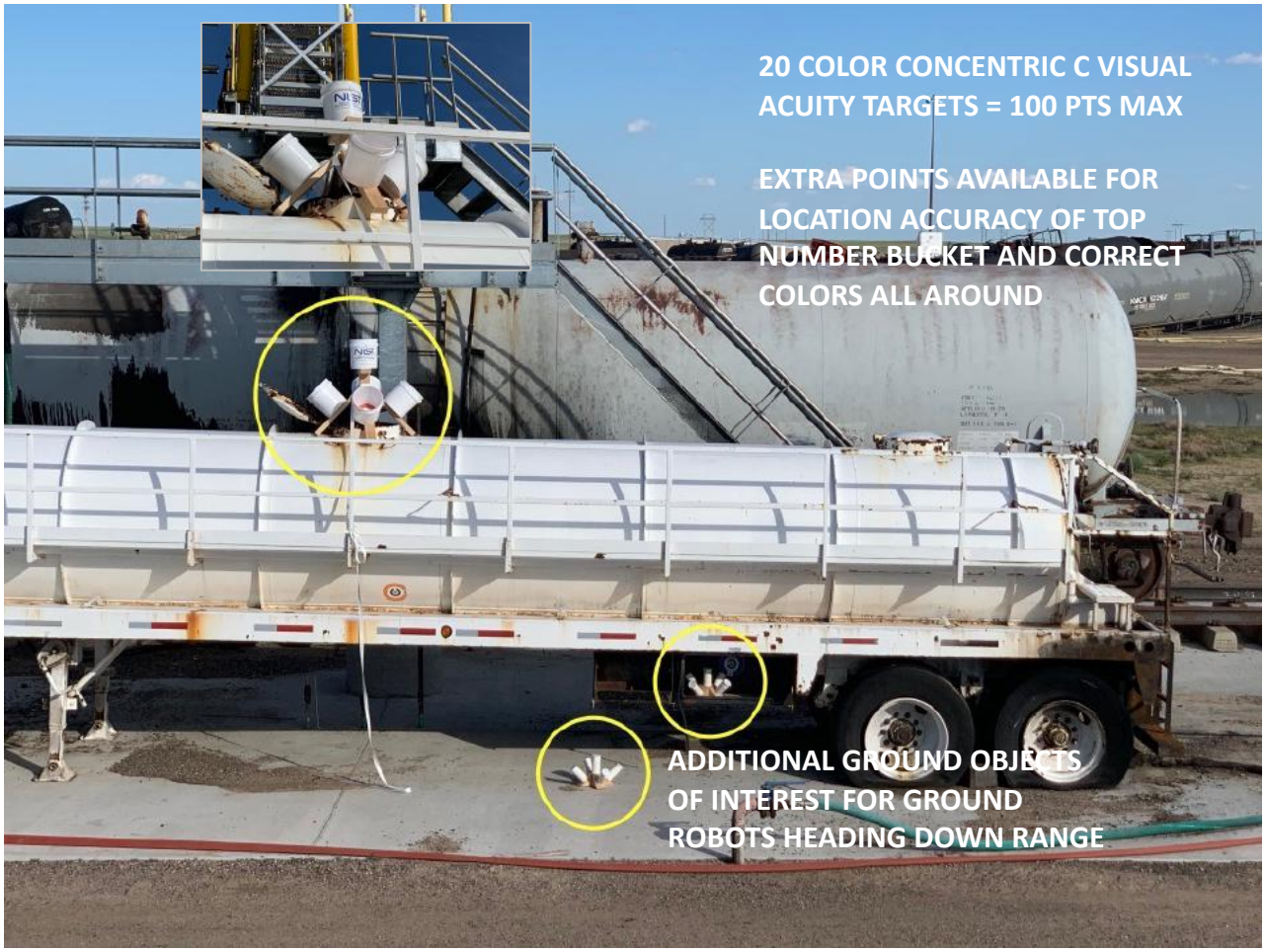
EFFICIENCY
CORRECT GAPS / MINUTES (DECIMAL)

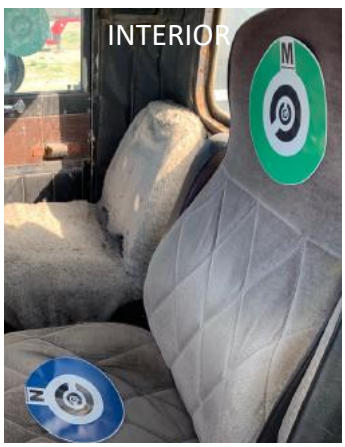
PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

Fuel Truck Identification

OPEN SCENARIO





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Pilot proficiency should only be compared using similar systems.

Fuel Truck Identification

OPEN SCENARIO

Robot Make: _____

Robot Model: _____

Robot Config: _____

Pilot Code : _____ VO Code: _____

Facility : _____

YYYY-MM-DD : _____

Time (2400): _____ Lane #: _____

LOCATION	LIGHTING			WIND		PILOT VIEW		TIME LIMIT		
	DAYLIGHT 1000+ LUX	LIGHTED 300+ LUX	DARK < 1 LUX	AVERAGE	GUSTS	LINE OF SIGHT FACING LANE OPTIONAL V.O.	INTERFACE ONLY BACK TO LANE MANDATORY V.O.	10 MIN	20 MIN	____ MIN
(CIRCLE ONE OR FILL IN)	(CIRCLE ONE)			____ MPH	____ MPH	(CIRCLE ONE)		(CIRCLE ONE OR FILL IN)		

OPEN SCENARIO | VEHICLE IDENTIFICATION

ALL SCORING IS FROM THE DESIGNATED ORBIT ALTITUDE EXCEPT FOR THE PERCH TARGETS ON THE FRONT (A) AND REAR (C) SIDE

START TIMER *(CAPTURE CLOCK IMAGE)* : :

FULLY ALIGNED IMAGE = 5
PARTIALLY ALIGNED IMAGE = 1

CIRCLE GAPS CORRECTLY IDENTIFIED VERBALLY BY THE PILOT DURING THE TRIAL = 1 POINT EACH

0	ROOF OMNI STAND – INSIDE TOP BUCKET NUMBER Identify Acuity or Disk Insert to Determine if Inspection is Needed	#	TOP BUCKET #: _____						
1	A1 – FRONT SIDE – ROOFTOP OMNI BUCKET	A1	5 pt	1 pt	0 pt	T	BL	R	BR	L
2	A2 – FRONT SIDE – WINDSHIELD CENTER FOR INTERIOR OBJECTS	A2	5 pt	1 pt	0 pt	TR	B	TR	L	BR
3	A3 – FRONT SIDE – VIN #	A3	5 pt	1 pt	0 pt	R	TL	T	BL	B
4	A4 – FRONT SIDE – LICENSE PLATE	A4	5 pt	1 pt	0 pt	BR	R	TL	L	BR
5	A5 – FRONT SIDE – PERCH POSITION UNDERBODY BUCKET	A5	5 pt	1 pt	0 pt	B	TL	R	BL	T
6	B1 – PASSENGER SIDE – ROOFTOP OMNI BUCKET	B1	5 pt	1 pt	0 pt	BL	T	BR	R	TL
7	B2 – PASSENGER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	B2	5 pt	1 pt	0 pt	L	BR	T	TL	R
8	B3 – PASSENGER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	B3	5 pt	1 pt	0 pt	TL	R	TR	L	BR
9	B4 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B4	5 pt	1 pt	0 pt	T	BL	R	TL	B
10	B5 – PASSENGER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	B5	5 pt	1 pt	0 pt	TR	B	TL	B	BL
11	C1 – REAR SIDE – ROOFTOP OMNI BUCKET	C1	5 pt	1 pt	0 pt	R	TL	B	BL	R
12	C2 – REAR SIDE – WINDOW CENTER FOR INTERIOR OBJECTS	C2	5 pt	1 pt	0 pt	BR	T	TL	R	BL
13	C3 – REAR SIDE – LICENSE PLATE	C3	5 pt	1 pt	0 pt	B	TR	R	BL	T
14	C4 – REAR SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	C4	5 pt	1 pt	0 pt	BL	R	BL	T	BR
15	C5 – REAR SIDE – PERCH POSITION UNDERBODY BUCKET	C5	5 pt	1 pt	0 pt	L	TL	R	BR	T
16	D1 – DRIVER SIDE – ROOFTOP OMNI BUCKET	D1	5 pt	1 pt	0 pt	TL	B	TR	R	BR
17	D2 – DRIVER SIDE – FRONT WINDOW FOR INTERIOR OBJECTS	D2	5 pt	1 pt	0 pt	T	BL	B	TR	L
18	D3 – DRIVER SIDE – REAR WINDOW FOR INTERIOR OBJECTS	D3	5 pt	1 pt	0 pt	TR	L	BL	R	TL
19	D4 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D4	5 pt	1 pt	0 pt	R	BL	T	TR	B
20	D5 – DRIVER SIDE – EXTERIOR FEATURE OR SURROUNDING GROUND	D5	5 pt	1 pt	0 pt	BR	B	TL	B	TR

STOP TIMER *(CAPTURE CLOCK IMAGE)* : :

ELAPSED TRIAL TIME: MIN SEC

TARGETS VERSION 2020B

MAN SCORE
TOTAL PONTS (MAX = 100)

EFFICIENCY
MAN SCORE / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME

PAY SCORE
CORRECT GAPS (MAX = 100)

EFFICIENCY
CORRECT GAPS / MINUTES (DECIMAL)

PASS (>____)

OR CIRCLE FAILURE
SAFETY SCORE TIME